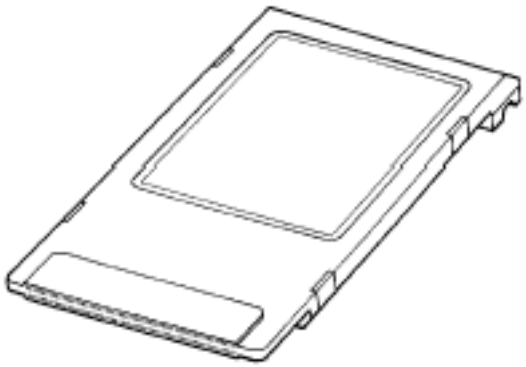
MTS 3100 Mastertech®

Toyota/Lexus
1989-2004

OEM Application

Operator's Manual

(North American)



With ECU Reprogramming

Vetronix
Bosch Group

Vetronix Corporation
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CAUTIONS, NOTICES, HINTS:

In this manual:

- CAUTIONS are boxed text, and indicate there is a possibility of injury to you or other people.
- NOTICES are also boxed text, and indicate the possibility of damage to the component being repaired.
- HINTS are also boxed text, and provide additional information.

Refer to the Repair Manual for the vehicle being tested for further Cautions, Notices, and Hints.

FCC COMPLIANCE

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Re-orient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

OPERATING PRECAUTIONS

CAUTION!

When performing any checks with the engine running in an enclosed space such as a garage, be sure there is proper ventilation. Never inhale exhaust gases; they contain carbon monoxide, a colorless, odorless, extremely dangerous gas which can cause unconsciousness or death.

CAUTION!

Do not use the Autoprobe to check voltages higher than 20 volts. (Don't plug the Autoprobe into a standard AC wall outlet). Also, the Autoprobe should be kept away from high tension secondary ignition wires when the engine is cranking or running.

CAUTION!

FOR SAFETY REASONS OBSERVE THE FOLLOWING:

- Be sure to safely route all cables when driving with the Tester connected to the vehicle (i.e., keep cables away from feet, pedals, steering wheel and shift lever).
- Two persons are required when test driving with the Tester: one person to drive the vehicle, and one person to operate the Tester.

NOTE

Do not remove or install a program card or cartridge while power is applied to the Tester. If you wish to change or add a program card or cartridge, first turn the Tester off by pressing (#) (EXIT).

NOTE

To avoid damage to the underhood Check Connector, do not close the hood when the Check Connector Cable is connected to the Check Connector. The Check Connector should be removed from its mount on the firewall or fender apron when test driving the vehicle with the Check Connector Cable attached.

FOREWORD

The Diagnostic Toolset is designed for use by trained service personnel. It has been developed to aid in the diagnosis and repair of automotive electronic systems. Every attempt has been made to provide complete and accurate technical information based on factory service information available at the time of publication. However, the right is reserved to make changes at any time without notice.

To familiarize yourself with the toolset capabilities and how to use them, please read through the operator's manual before putting the Diagnostic Toolset to work. The toolset is designed to reduce time-consuming reference to manuals as much as possible. Once familiar with the toolset and its operation, you will be able to spend more time diagnosing and less time reading.

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1.0 THE DIAGNOSTIC TOOLSET OPERATOR'S MANUALS

The Diagnostic Toolset Operator's Manual is divided into eight sections.

The Toolset Description chapter lists the diagnostic capabilities of the toolset and describes the hardware components contained within each kit.

The Tester chapter describes how to connect the hand-held Tester to the vehicle and how to operate the Tester. The Tester must be used in conjunction with a program card.

The OBD, OBD-II, NVH, Break-Out Box, Customize, and Gas Analyzer Program Card chapters provide directions for connecting the related components to the Tester and the vehicle, and operating instructions for the test modes available in the program card.

This Operator's Manual should be used in conjunction with the Repair Manual for the vehicle being tested.

SCREEN DISPLAYS IN MANUALS

The data shown in the Tester screen displays is sample data for illustration purposes only and may be different from the data displayed when different vehicles are tested.

LOCATION OF VEHICLE ECUs AND TEST CONNECTORS

For the location of vehicle ECUs and test connectors, refer to the Repair Manual and the Electrical Wiring Diagram (EWD) for the vehicle being tested.

THE TESTER KEYPAD

In the Diagnostic Toolset Operator's Manual, the number, symbol, word, or abbreviation on the Tester keys are indicated in boldface type and enclosed in a box. For example, 8, ✱, #, ENTER and EXIT. When two keys are shown together, hold down the first key while pressing the second key. For example, # EXIT means to press and hold the # key, then press the EXIT key.

CAUTIONS, NOTICES, HINTS

In the Diagnostic Toolset manuals:

CAUTION!	CAUTIONS are separated from the text and indicate there is a possibility of injury to you or other people.

NOTE	NOTES are also separated from the text and indicate the possibility of damage to the component being repaired.

HINT	HINTS are separated from the text and provide additional, useful information.

Refer to the Repair Manual for the vehicle being tested for further Cautions, Notices and Hints.

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NOTE	Do not use the Autoprobe to check voltages higher than 20 volts. (Don't plug the Autoprobe into a standard AC wall outlet). Also, the Autoprobe should be kept away from high tension secondary ignition wires when the engine is cranking or running.

CAUTION!	FOR SAFETY REASONS OBSERVE THE FOLLOWING: • Be sure to safely route all cables when driving with the Tester connected to the vehicle (i.e., keep cables away from feet, pedals, steering wheel and shift lever). • Two persons are required when test driving with the Tester: one person to drive the vehicle, and one person to operate the Tester.

NOTE	Do not remove or install a program card or cartridge while power is applied to the Tester. If you wish to change or add a program card or cartridge, first turn the Tester off by pressing (#) (EXIT).

NOTE	To avoid damage to the underhood Check Connector, do not close the hood when the Check Connector Cable is connected to the Check Connector. The Check Connector should be removed from its mount on the firewall or fender apron when test driving the vehicle with the Check Connector Cable attached.

DATA MEMORY RETENTION

Data that has been captured by the Tester can be replayed, printed on a printer, or transferred to a computer for further analysis. The data will be retained within the Tester memory as long as the Lithium battery provides the proper power or until the data is erased.

HINT	If the Tester is turned on without a program card installed, or with a different program card installed, the data stored in the Tester memory, such as Snapshot data, will be lost.

WARRANTY AND REPAIR

WARRANTY

The Tester, Autoprobe, NVH Analyzer, Break-out Box, cables, adapters, and program cards are warranted by Vetronix Corporation to the original consumer to be free of defects in material and workmanship for one year.

The warranty period is from the date of shipment to the original consumer. If a product is found to be defective during this period, the product can be returned to an authorized Vetronix Service Center and Vetronix Corporation will repair or replace the unit free of charge. This warranty does not cover any part that has been abused, altered, used for a purpose other than that which it was intended, or used in a manner inconsistent with instructions regarding its use including but not limited to the following:

- Damage due to improper product operation or product modification.
- Damage due to use of non-Vetronix supplied cables and accessory items, or unauthorized peripheral equipment.
- Damage due to dropping or other severe impact to the product.
- Damage due to reverse polarity of 12-volt power and ground.
- Damage due to exposure to excessive temperatures.
- Damage or loss that may occur during shipping

This warranty also excludes all incidental or consequential damages.

REPAIR SERVICE

If you experience a problem with the Tester, NVH Analyzer, Break-out Box, Autoprobe, or program card, read the Operator's Manual carefully to make sure that you are operating the unit properly. To avoid the inconvenience of returning a non-defective unit for repair, it is advisable to exercise the Self Test procedures outlined in the Tester Operator's Manual to find out if there is a problem with the unit.

If it is determined that a problem exists, call a Vetronix Service Center (or authorized Vetronix Service Agent). A service technician will attempt to identify the nature of the problem and recommend a course of action. If the unit requires repair, package the Tester and program card, along with all cables and adapters, and send it freight prepaid to the repair service center listed for the country in which you live. Please enclose a note which provides the date of purchase, a brief explanation of the problem, and your return address. (No CODs, please.)

When the unit is received at the Vetronix Service Center it will be diagnosed, repaired or replaced, and returned. If the unit is determined to be in warranty, it will be repaired or replaced with no charge and returned freight prepaid.

If the unit is determined to be out of warranty, it will be repaired for a nominal service charge plus return freight.

Please contact the Toyota Distributor Service Department or Vetronix Service Center in your country regarding the procedure of warranty and repair service.

SERVICE CENTER	RESPONSIBLE AREA
USA	North America (except Canada), Central America & South America
Europe	Europe, Africa & Middle East
Canada	Canada
Japan	Asia & Oceania
Australia	Australia and New Zealand

VETRONIX SERVICE CENTERS

USA

VETRONIX CORPORATION
2030 Alameda Padre Serra
Santa Barbara, CA 93103 USA
TEL: 800-321-4889 xt. 2
TEL: 805-966-2000
FAX: 805-965-3497

CANADA

VETRONIX REPAIR SERVICE
c/o Custone Electromotive Inc.
1150 Champlain Court
Whitby, Ontario L1N 6A8
905-668-2664

JAPAN

VETRONIX JAPAN CO. LTD.
Queens Tower C-17F
2-3-5 Minatomirai
Nishi Ku, Yokohama-Shi
Kanagawa-Ken, 220-6204
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FAX: (045) 222-0970

EUROPE

VETRONIX SERVICE CENTER
c/o Getronics Service GmbH
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AUSTRALIA

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TAKING THE PRODUCT BACK AND RECYCLING

Applicable to product that is sold into the European Union, the European Union has passed a directive called Waste Electrical and Electronic Equipment, or WEEE for short, to ensure that systems are setup throughout the EU for the collection, treating and recycling of electronic waste.

This ensures that the devices are recycled in a resource-saving way representing no danger to health or the environment.

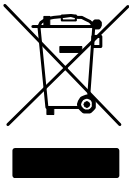

FIGURE 1 WEEE Logo

The WEEE symbol (see Figure 1) on the product or its packaging shows that the product must not be disposed of as residual garbage. The user is obliged to collect the old devices separately and return them to the WEEE take-back system for recycling.

The WEEE directive concerns all Bosch devices but not external cables or batteries. For more information on the Bosch GmbH Recycling Program, contact one of the ETAS sales and service locations listed below.

ETAS HQ

ETAS GmbH

Borsigstraße 14
70469 Stuttgart
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Phone: +49 711 89661-0
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WWW: www.etasgroup.com

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Korea

Phone: +82 2 57 47-016
Fax: +82 2 57 47-120
E-mail: sales@etas.co.kr

China

ETAS (Shanghai) Co., Ltd.

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Phone: +86 21 5037 2220
Fax: +86 21 5037 2221
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WWW: www.etasgroup.com

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1.0 DIAGNOSTIC CAPABILITIES

DIAGNOSTIC TOOLSET OVERVIEW

The Diagnostic Toolset consists of a hand-held Tester and attachments, which allows the use of one tool for many diagnostic applications. The Toolset is designed so that future diagnostic applications can easily be incorporated into the existing Toolset.

The diagnostic capabilities of the Toolset components are described in this section. A description of the hardware related to each component is included in the following sections.

THE TESTER

The Tester is used by professional technicians as an aid in diagnosing and repairing automotive electrical and electronic systems. It is designed to test Electronic Control Modules (ECMs) and Electronic Control Units (ECUs) for brake, body, and chassis systems, and their associated sensors, actuators, and cable harnesses.

Capable of operating either as a stand-alone tool or as the control unit for the Diagnostic Toolset, the Tester employs plug-in program cards or cartridges, and can be adapted to operate with virtually all electronic systems—from the simplest to the most complex.

The Tester supports diagnosis of electronic systems on many makes of vehicles in addition to Toyota and Lexus.

The Autoprobe supplied with the Tester Kit provides additional troubleshooting capabilities. The Autoprobe is used as a smart digital voltmeter (DVM) to monitor input/output signals between the ECM/ECU and sensors and actuators, in addition to use as a probe for the oscilloscope function.

When the program card is installed and the Tester is connected to a vehicle's Data Link Connector (DLC), the following diagnostic functions are available:

- Display ECM/ECU Data List parameters.
- Display stored trouble codes and descriptions.
- Display sensor operation data.
- Display actuator control data.
- Display ON/OFF status of switch signals.
- Test feed-back systems such as the O2 sensor.
- Command clearing of some ECM/ECU trouble codes.
- Troubleshoot using the Autoprobe.
- Troubleshoot intermittent problems with Snapshot mode.
- Print test results to provide a permanent record.

The Tester hardware components are described in Section *2.0 Tester Kit Components on page 13*.

OBD AND OBD-II DIAGNOSTIC CAPABILITIES

The On Board Diagnostics (OBD and OBD-II) components provide diagnostics for the following electronic controllers:

- Engine Control Module (ECM)*
- Automatic Transmission (AT)*
- Air Bag Controller (AB)
- Anti-lock Brake System (ABS)
- Cruise Control System (CCS)
- Air Suspension System (AS)
- Automatic Air Conditioning (A/C)
- Traction Control System (TRAC)

  * OBD-II Support

The OBD and OBD-II functions access the following diagnostic data and signals on the vehicle:

- Data list and other OBD/OBD-II functions*
- Diagnostic Trouble Codes*
- Oxygen sensor signals
- Engine RPM data (IG-)

  * OBD-II Support

DVM and Oscilloscope Capabilities: The Tester can be used with the Autoprobe to measure vehicle voltage and signal frequencies.

- Volt meter
- Frequency counter (frequency, duty cycle)
- Oscilloscope

OBD and OBD-II hardware components are described in Section *3.0 OBD and OBD II Components on page 25*.

NVH ANALYZER DIAGNOSTIC CAPABILITIES

The Noise, Vibration, and Harshness (NVH) Analyzer assists in isolating the cause of noise and vibration problems. The frequency of the noise or vibration is electronically matched with vehicle RPM and speed in order to help diagnose the source of the vibration or noise.

The NVH Analyzer should be used in a stable vibration and noise environment.

When connected to the Tester, the NVH Analyzer and related Accelerometer and microphone can:

- Display Barchart graphs of vibration levels for wheels, engine, and drivetrain.
- Display recorded vibrations over time in a “Raster” format (3-D).
- Display and store spectral analysis of vibration or noise data from 5 Hz to 500 Hz.
- Detect vibrations from .001G to 1G.
- Display and store dynamic vehicle data (RPM, vehicle speed) integrated with the corresponding spectral vibration data.
- Separate and classify vibration energy by source (Engine, Driveline, Wheels) and display in the Spectral, Raster, and Barchart display modes.

The NVH Analyzer diagnoses data received from the following sources:

- Vibration data using the Accelerometer or microphone sensor inputs
- The vehicle serial data stream or ignition signal
- Vehicle data base information
- Operator input

CAUTION!

Two technicians are required when testing with the NVH Analyzer. One technician must actually drive the car, and the second technician operates the NVH Analyzer. For safety reasons, one technician cannot perform all functions.

NVH Analyzer hardware components are described in Section *4.0 NVH Analyzer Kit Components on page 27*.

BREAK-OUT BOX DIAGNOSTIC CAPABILITIES

The Break-out Box provides the capability of monitoring data on any combination of signal lines that connect the vehicle's electrical/electronic components to the ECU. The installation of the Break-out Box harness has no effect on the operation of the controller or the vehicle.

When used in conjunction with the Tester and the program card, the Break-out Box supports diagnosis of the following electronically controlled vehicle systems:

- Engine
- Automatic Transmission (AT)
- Anti-lock Brake System (ABS)
- Cruise Control System (CCS)
- Theft Deterrent System (TDS)

The Break-out Box can be used to support inspection of:

- Sensors
- Actuators
- Wiring harness shorts or opens
- Open grounds
- ECM/ECU operation

The Break-out Box contains 124 input channels: 120 for ECU inputs and four for external inputs (analog signals only). The Break-out Box can monitor signals between ±40V, with the following types of measurements:

- Analog
- Timing
  - Frequency
  - Pulse Interval
  - Pulse Width
  - Duty Cycle
- Signal Analysis
  - Oscilloscope

External Output Channels on the Break-out Box allow monitoring of up to four signals via an external source such as a volt meter or oscilloscope.

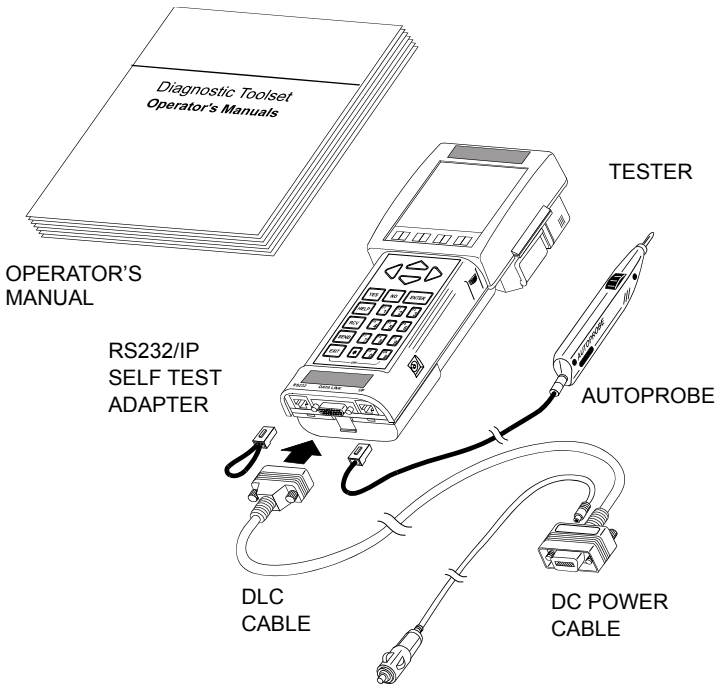
If a problem is detected in the operation of the Break-out Box or program card, you can perform a self test on the Break-out Box to help isolate the problem.

Break-out Box hardware components are described in Section *5.0 Break-Out Box Kit Components on page 29*.

2.0 TESTER KIT COMPONENTS

The Tester kit components consist of the hand-held Tester, Autoprobe, Data Link Connector (DLC) Cable, DC Power Cable, RS232/IP Self Test adapter, OBD and OBD-II adapter cables, and the Diagnostic Toolset Operator's Manual. The Tester and related components are described in detail in this section. Cables and adapters related to the OBD functions are illustrated and described in Section *3.0 OBD and OBD II Components on page 25*

TESTER KIT COMPONENTS



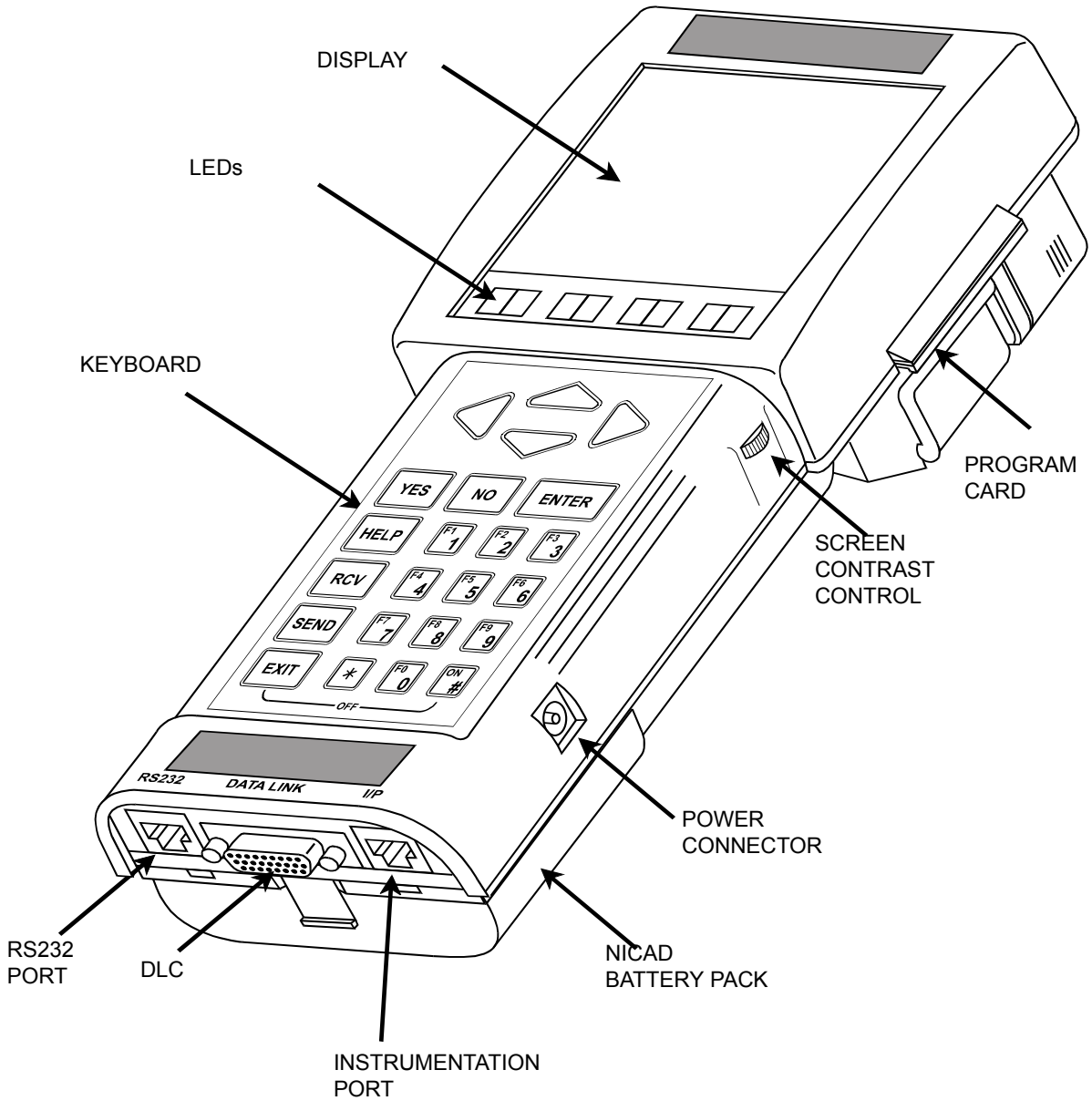
* For North American countries, the Tester is referred to as the Diagnostic Tester. For other countries, the Tester is referred to as the Intelligent Tester.

TESTER FEATURES

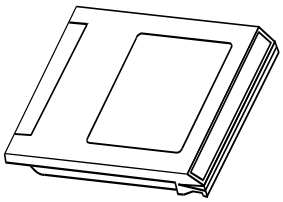
The Tester can be hand-held or placed on a flat surface. An adjustable hand strap on the back provides added security while holding the Tester.

A built-in support stand allows the Tester to be tilted to the most convenient viewing angle when it is not handheld.

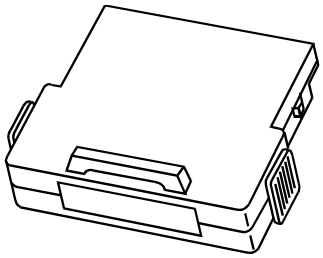
TESTER FEATURES



PROGRAM CARD



I/O CARTRIDGE



PROGRAM CARDS AND CARTRIDGES

The Tester uses plug-in program card and cartridge modules which contain the software programs for testing specific vehicles and systems. The modules are upgraded periodically to include new vehicles, model years, and systems. Specific operating instructions are provided for diagnostic test functions contained in the program card(s) or cartridge(s).

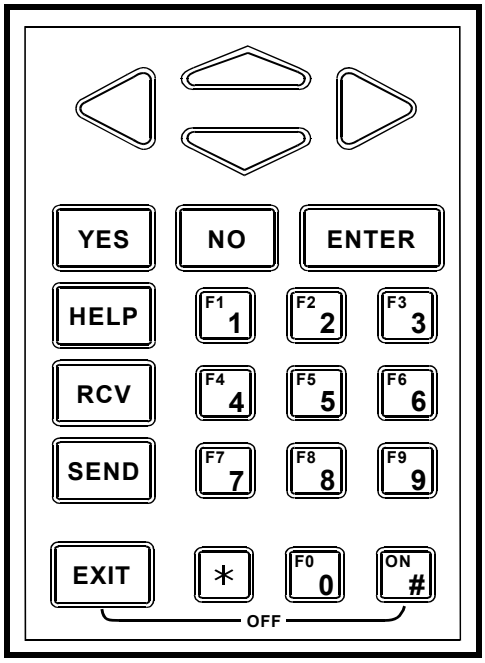
Two kinds of modules can be used with the Tester: program cards and Input/Output (I/O) Cartridges.

PROGRAM CARDS

Multiple Program Cards may be required to provide the complete diagnostic testing capabilities of the toolset. Program Cards are installed in the slot on the upper right side of the Tester (below the display). The program card slot is keyed so that the card can only be installed in the proper orientation.

I/O CARTRIDGES

I/O Cartridges such as the OBD-II Cartridge are used to expand the I/O (Input/Output) capability of the Tester. I/O cartridges plug into the slot at the top rear of the Tester. The OBD-II I/O Cartridge may be kept in the Tester when performing other functions.



TESTER KEYBOARD

KEYBOARD

The 23-key keyboard allows you to make menu selections or input information. Through the keyboard you can tell the Tester which data you want to see and in which format you want it displayed. While performing some tests you can even control the operation of certain component functions through the keyboard.

The (*) and (#) keys are used to modify other keys. For example, if the instructions say press (#)(EXIT), press the (#) key first and hold it down while pressing the (EXIT) key.

Some keys, such as the numeric ((0) - (9)) and (YES) and (NO) keys, have different functions depending on which test mode is in use. The (HELP) key displays a list of the active keys and their functions in the current test mode.

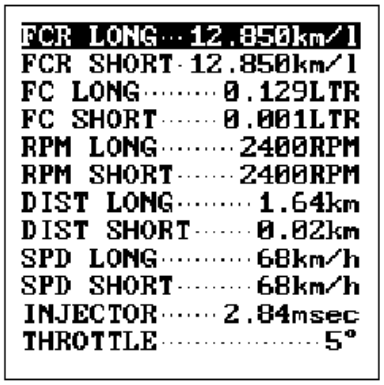
A chart of the keys and their functions is illustrated on the following page.

TESTER KEY FUNCTIONS

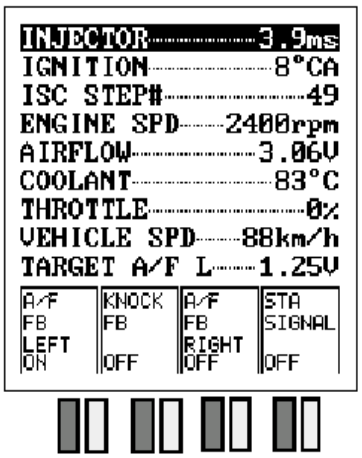
KEY	FUNCTION
✱ and #	Similar to the shift key on a typewriter, the ✱ and # keys are used in conjunction with other keys as a modifier. Press the ✱ or # key and hold it down while you press the second key. For example ✱ HELP or # EXIT.
ON	Turn the Tester on.
# EXIT	Turn the Tester off.
△ ▽	Move the cursor (highlight) on the display up or down.
◁ ▷	Move the cursor (highlight) on the display left or right.
YES and NO	Answer questions asked on the Tester display. Display and select data parameters to monitor.
ENTER	Confirm information on the Tester display. Terminate a numeric entry. Move ahead in procedures. Select a highlighted menu entry.
HELP	Display a summary of the active keys.
✱ HELP	Display information about the highlighted item. (Not available in all modes.)
RCV	Receive input from an external device.
SEND	Send information (data only) to an external device such as a printer.
# SEND	Screen Print. Send the current display to a printer.
EXIT	Return to a previous step in procedures. Return to normal operation after the HELP key has been pressed.
0 - 9	Select and control modes. Input data to the Tester and designate trouble codes.
F0 - F9	Use as “Hot Keys” in data displays.
F9	Change the size of characters displayed on the screen. (Not available in all modes.)
F0	Turn the cursor on and off in some modes.

DISPLAY

The 3.0 x 3.0 inch graphic display allows data to be viewed in several graphic modes and in large and small character sizes. The Tester can display real-time bar graphs, plots, and data for several parameters at the same time, giving an accurate account of current operating conditions. The display contrast can be adjusted by turning the thumb wheel on the right side of the Tester.

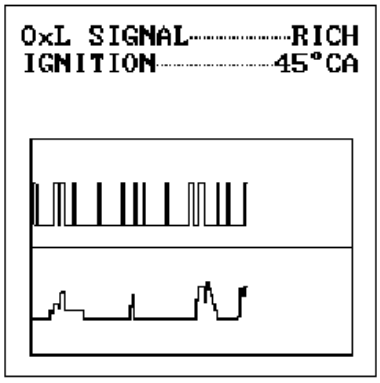


DATA LIST (F1)

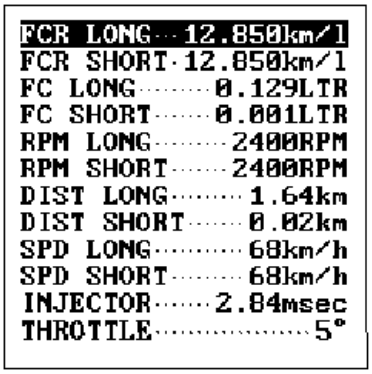


LED/LIST (F2)

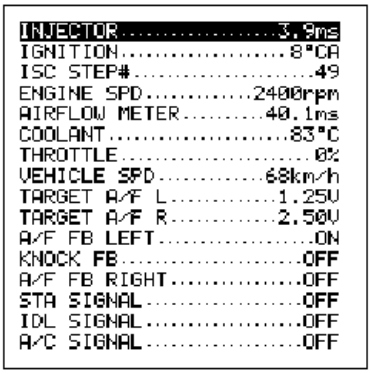
BAR GRAPH (F3)



LINE GRAPH (F4)



LARGE CHARACTERS (F9)



COMPRESSED CHARACTERS (F9)

DATA LINK CONNECTOR AND CABLE

Communication between the Tester and the vehicle's electronic systems is through the heavy duty 14-pin to 26-pin Data Link Connector (DLC) cable that is connected to the bottom center of the Tester. Various adapters or adapter cables are used to connect the 14-pin end of the DLC cable to the vehicle's Check Connector, TDCL, or DLC3 (M-OBD).

POWER SOURCES

The Tester is intended to be powered from the vehicle's battery via the cigarette lighter socket, or directly from the battery with the Battery Adapter Cable. The Tester may also be powered in the following ways:

- By the DLC1 (Check Connector) cable when the DLC1 cable is connected to the underhood DLC1.
- By the DLC3 (OBD-II Connector) cable when the DLC3 cable is connected to the DLC3 on the vehicle.
- By the AC/DC power supply.
- By the rechargeable battery pack. Powering the Tester with the battery pack is described below.

BATTERY BACKED OPERATION

A rechargeable NiCad battery pack is provided to power the Tester under the following conditions:

- When the vehicle ignition is off.
- While the engine is cranking.
- Temporary off-vehicle "stand-alone" usage.

Although the Tester will operate on the battery pack, it is recommended that the Tester be connected to the vehicle's 12-volt power supply during testing.

See the Tester Operator's Manual for battery charging and replacement instructions.

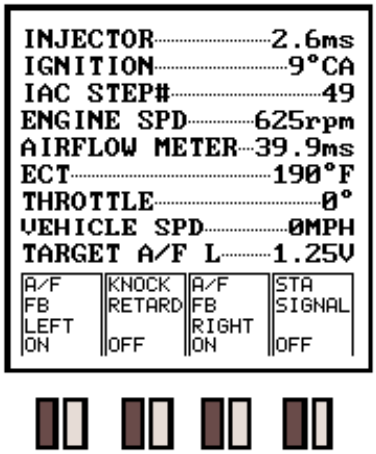
BATTERY BACKED MEMORY

Tester configuration and data that has been captured during testing are retained in the Tester battery backed memory under power from an onboard lithium battery. This battery should last up to 2 years from the time of purchase.

See Tester Operator's Manual for battery replacement instructions.

BEEPER

The Tester contains an audio output device which can be used for user prompts, test begin and end indications, and error indications.

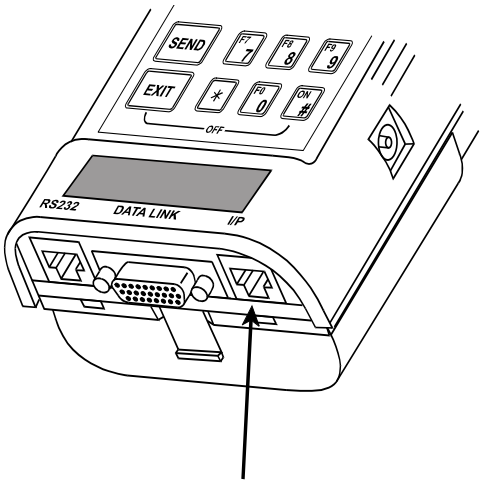


LEDs

Eight Light Emitting Diodes (LEDs), four red and four green, are located immediately below the display and are visible only when activated. The green light on the right is lit when the Tester is in battery charge mode while the display is off.

In LED/LIST mode the status of four discrete parameters can be monitored at a time. In the display on the left, the green LED beneath KNOCK RETARD will be on when KNOCK RETARD is on, and the red LED will be on when KNOCK RETARD is off.

For switched signals, such as A/C or Brake Switch, RED means OFF and GREEN means ON.

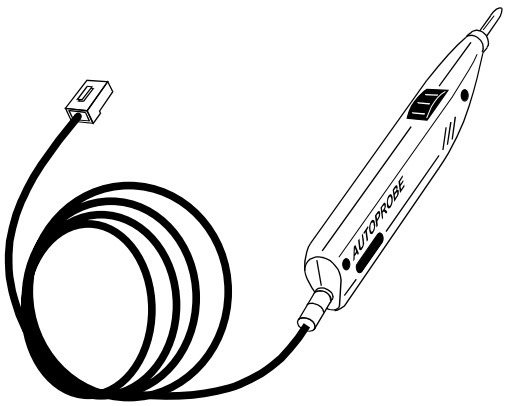


INSTRUMENTATION PORT

INSTRUMENTATION PORT AND DEVICES

The Instrumentation Port (I/P) is used to connect the Tester to one or more instrumentation devices which are used to expand the diagnostic capability of the Tester. The I/P connector receives signals which provide a serial communication link from "smart" instrumentation devices. These devices contain microprocessors which can perform specific diagnostic functions and send information to the Tester.

The Instrumentation Port also contains circuits which can be used for making direct signal measurements. This capability is used to support instrumentation devices which may not require a microprocessor. The Autoprobe and NVH Analyzer are examples of this type of instrumentation devices.



AUTOPROBE

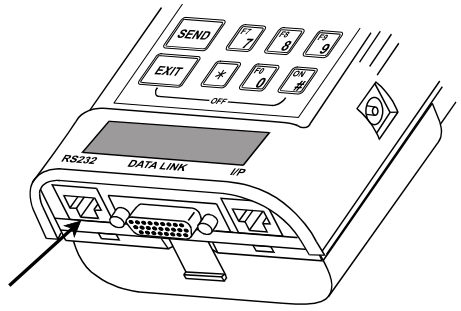
AUTOPROBE

The Autoprobe provides a convenient means of signal measurement and operates under control of the Tester.

In the signal measurement mode, the Autoprobe functions as a digital volt meter (DVM) and is used to passively monitor voltage signals from the ECU, sensors, actuators, harness, and connectors.

The Autoprobe is also used for signal input to the oscilloscope, as well as timing (frequency, duty cycle, pulse width) measurements on vehicle signals.

NOTE	The Autoprobe (DVM) provided in the Tester kit is only intended for automotive type signal measurement. It is not a lab-quality Digital Volt Ohm Meter (DVOM).

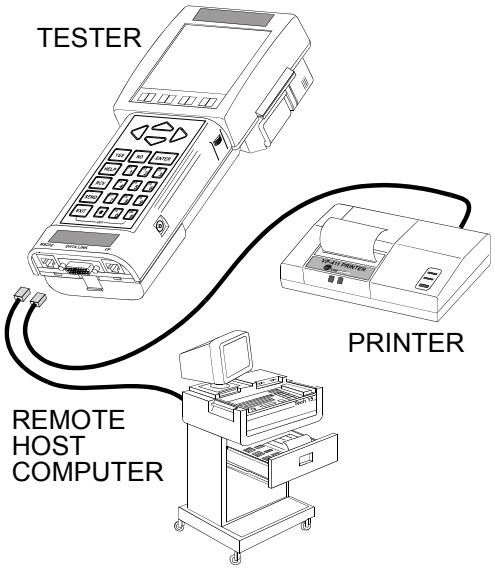


RS232 PORT

INSTRUMENTATION PORT

RS232 PORT AND RS232 PORT DEVICES

The Tester contains an RS232 Input/Output (I/O) serial data connection capable of supporting peripheral devices. The RS232 connection allows the Tester to transfer and receive data to and from other RS232 compatible devices such as a remote host computer or serial printer.



RS232 PORT DEVICES

REMOTE HOST COMPUTER

Using the RS232 port, the Tester can transfer and receive data to and from remote host computers including personal computers, computer-based test equipment, and data base computer systems at data rates up to 115.2k baud.

PRINTER

When the Tester is connected to a compatible serial printer, such as the optional VP-411 or VP-414 via the RS232 port, the following functions are available:

•Print diagnostic parameters

•Print trouble codes

•Print test results

•Print display information (including bar graphs and plots)

TESTER CHARACTERISTICS

ITEM	CHARACTERISTIC
SIZE	10.2 x 27.9 x 5.1 CM (4.0 x 11.0 x 2.0 INCHES)
WEIGHT	1.02 KG (2.25 LBS) WITH BATTERY PACK
POWER	3.0 WATTS @ 12 VDC
INPUT VOLTAGE	6.5 TO 24 VDC (PROTECTED AGAINST REVERSE POLARITY)
KEYBOARD	23 KEY MEMBRANE
GRAPHIC DISPLAY	160 x 160 DOT GRAPHIC LIQUID CRYSTAL DISPLAY WITH EL BACK-LIGHTING
LED DISPLAY	8 LEDs (4 RED; 4 GREEN)
AUDIO OUTPUT	VARIABLE FREQUENCY BEEPER (200 Hz TO 10 kHz)
POWER SOURCES	• 12-VOLT VEHICLE POWER • NICAD BATTERY PACK (APPROXIMATELY 2 HOUR OPERATION) • LITHIUM BATTERY FOR CLOCK/CALENDER AND RAM (APPROXIMATELY 2 YEAR LIFE)
MODULES	• DIAGNOSTIC APPLICATION PROGRAM CARD • I/O CARTRIDGE
OPERATING TEMP.	0 °C TO 50 °C (32 °F TO 122 °F)
STORAGE TEMP.	-20 °C TO 60 °C (-4°F TO 140°F)

FUEL CONSUMPTION FUNCTION CHARACTERISTICS (OBD AND OBD II)

ITEM	CHARACTERISTIC
ACCURACY	1. FUEL CONSUMPTION ± 10% (When Fuel, Fuel Pressure, and Injector are operating properly.) 2. DISTANCE ± 10% 3. FUEL CONSUMPTION RATE ± 10% (When Fuel, Fuel Pressure, and Injector are operating properly.) NOTE: Long distance testing is recommended to obtain higher accuracy.

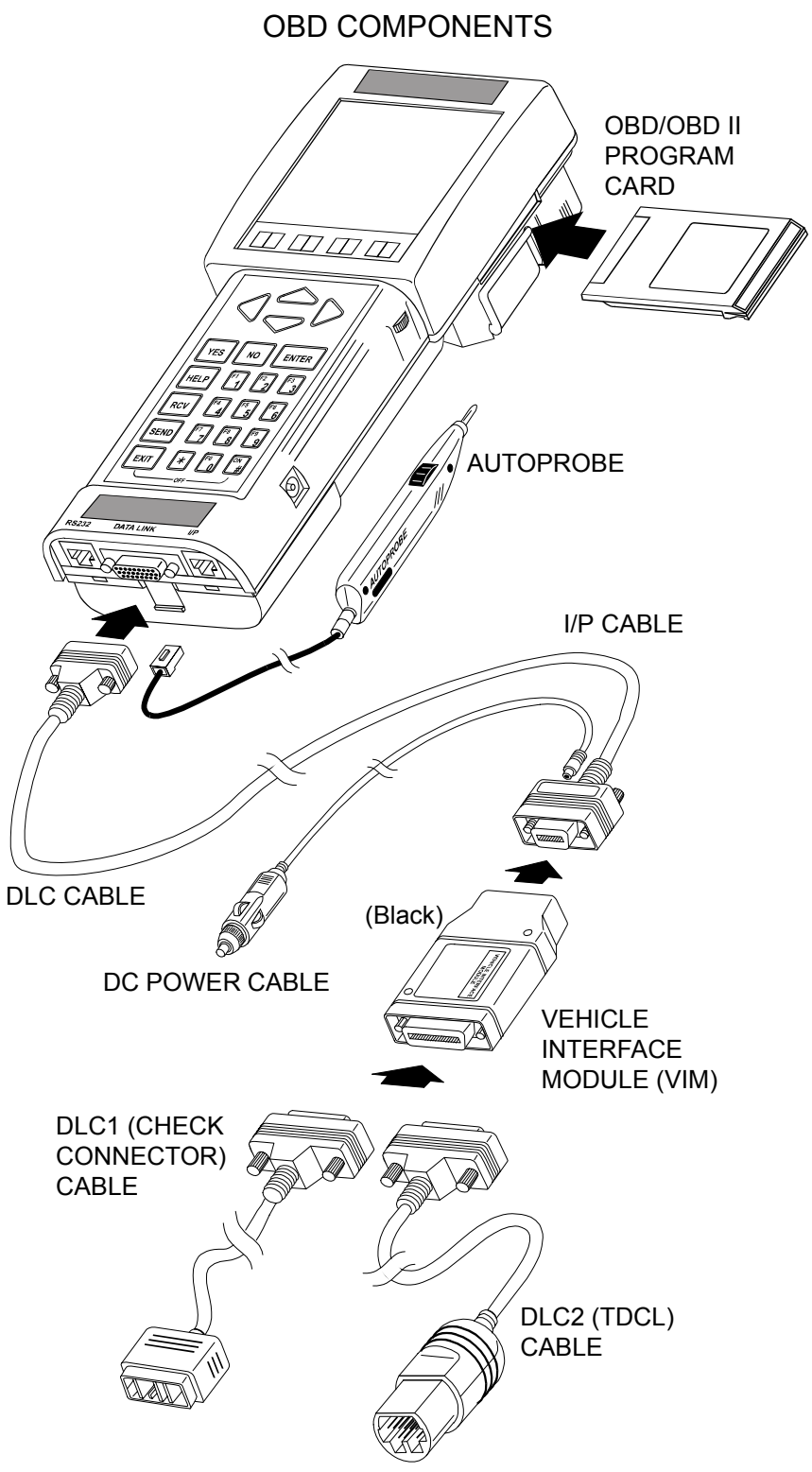
AUTOPROBE CHARACTERISTICS

ITEM	CHARACTERISTIC
SIZE	12.7 X 1.8 CM (5.0 X 0.7 INCH)
WEIGHT	113 G (0.25 LB) WITH CABLE
CONNECTOR	10-PIN RJ45 MODULAR PHONE CONNECTOR (KEYED)
CABLE LENGTH	1.5 METERS (5 FEET)
POWER SOURCE	5 VOLTS (SUPPLIED BY TESTER)
INPUT VOLTAGE	± 20 VOLTS/±5 VOLTS
INPUT IMPEDANCE METER MODE OSCILLOSCOPE MODE	300KΩ .1V/dv, .2V/dv, .5V/dv, 1V/dv — 1 MΩ 2V/dv or 5V/dv — 300KΩ
PROBE MEASUREMENTS	-VOLTAGE RELATIVE TO VEHICLE GROUND (± 20V) - PULSE WIDTH - FREQUENCY(5 Hz - 10 kHz for Frequency range) (0 - 10 kHz for Oscilloscope range)
MEASUREMENT ACCURACY	VOLTAGE ±0.1V * FREQUENCY 1Hz PULSE WIDTH 2 µS
SAMPLE SWITCH	OPERATOR INPUT TO TESTER
	* Voltage measurement accuracy is affected by any voltage offsets in the vehicle's ground circuit.

3.0 OBD AND OBD II COMPONENTS

OBD COMPONENTS

The OBD components consist of the Tester, Program Card, Vehicle Interface Module (VIM), DLC1 (Check Connector) cable, and DLC2 (TDCL) cable.



The Program Card provides the software for operating the OBD test modes.

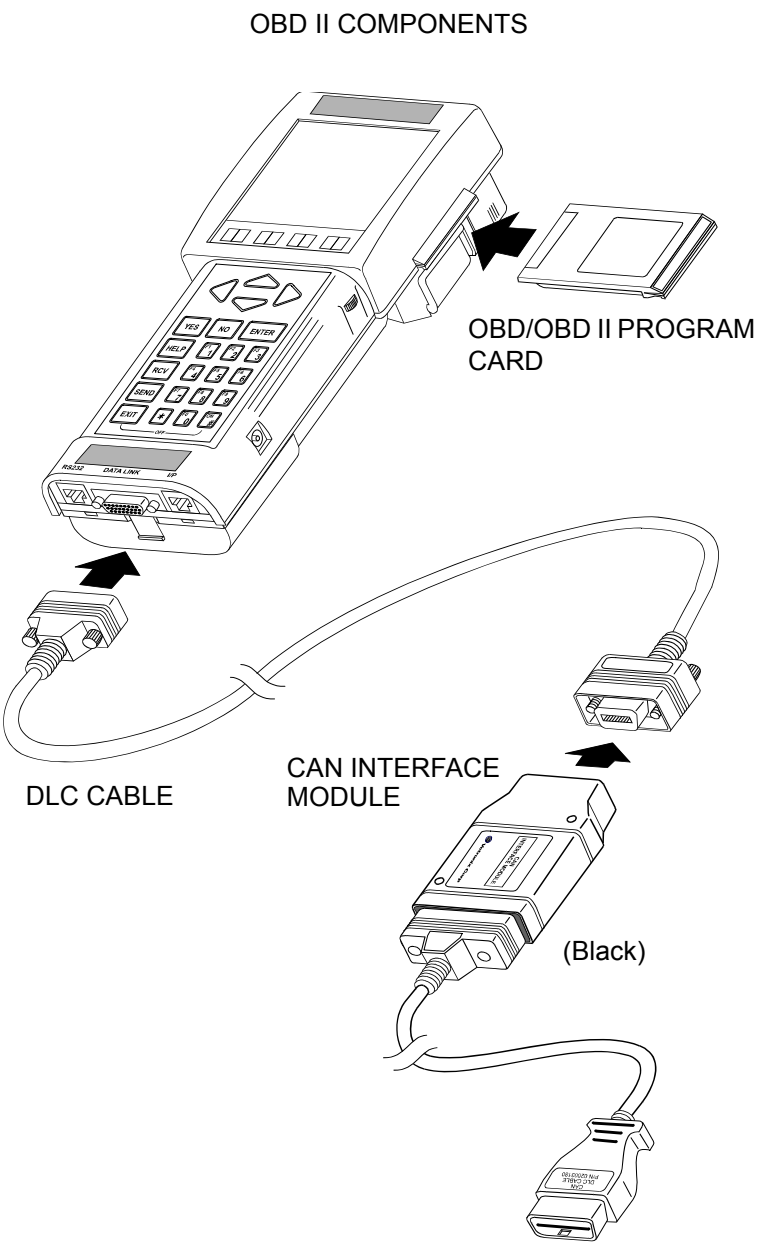
The Autoprobe is used as a smart digital volt meter to monitor input/output signals between the ECU and sensors and actuators, and as a probe for the oscilloscope function.

The VIM scales, buffers, and conditions electronic signals between the vehicle and the Tester.

The DLC1 cable connects the VIM to the DLC1 on the vehicle.

The DLC2 cable connects the VIM to the DLC2 on the vehicle.

OBD II COMPONENTS



The OBD II components consist of the Tester, Program Card, OBD-II Daughterboard which is installed in the tester, and the CAN Interface Module. The vehicle must be equipped with a DLC3 in order to perform OBD-II tests.

The Program Card is used in conjunction with the OBD-II Daughterboard to provide the software for operating the OBD-II test modes.

The CAN Interface Module connects the Tester DLC cable to the DLC3 on the vehicle.

NOTE: With the CAN Interface Module installed, the Diagnostic Tester will communicate with all DLC3/J1962 based systems. There is no need to remove the CAN Interface Module and reinstall the original DLC3 Cable to communicate with non-CAN systems.

4.0 NVH ANALYZER KIT COMPONENTS

The NVH Analyzer kit consists of a NVH Analyzer module, Program Card, I/P cable, and Accelerometer. A microphone is available as an option.

The NVH Analyzer components must be used in conjunction with the Tester, VIM, and related cables and adapter cables described in *OBD and OBD II Components on page 25*.

The Program Card provides the software for operating the NVH Analyzer test modes.

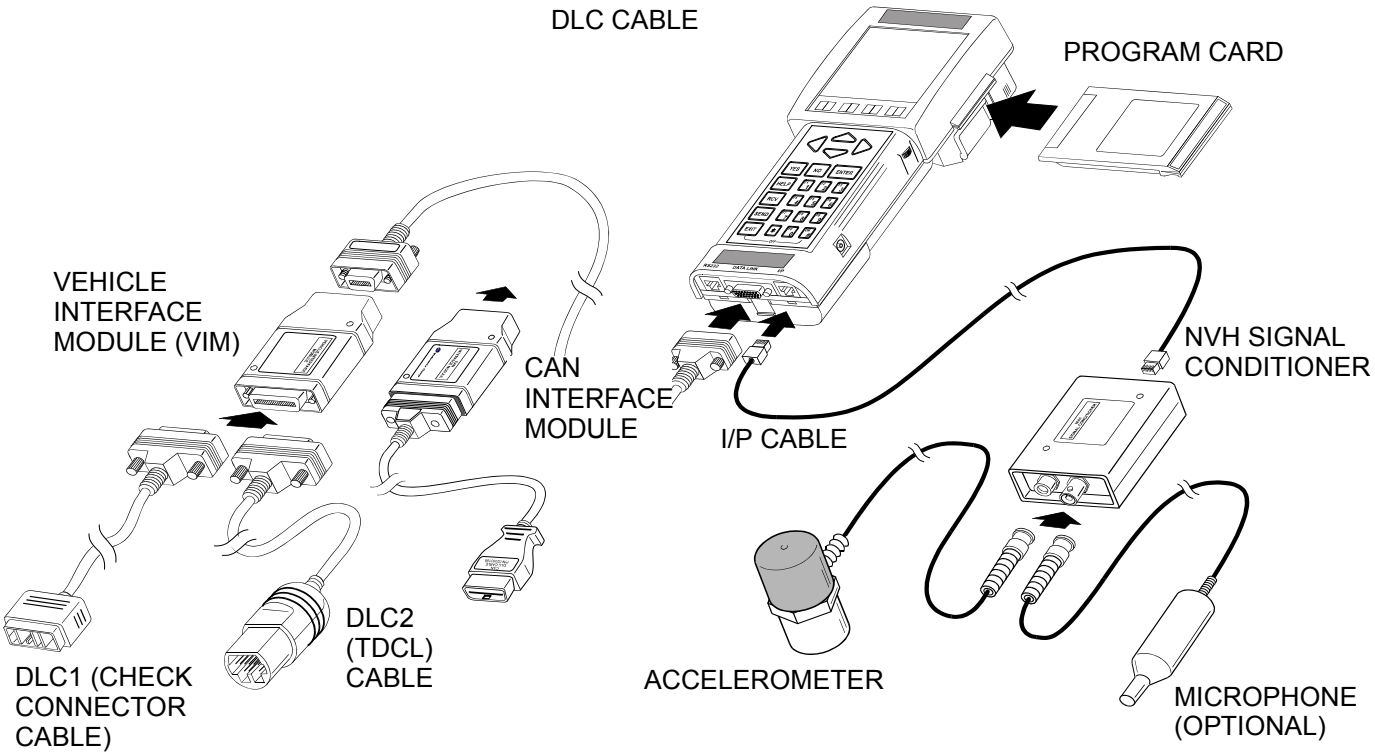
The NVH Analyzer module processes signals acquired from the Accelerometer or microphone for display on the Tester.

The I/P cable is used to connect the NVH Analyzer to the I/P port on the Tester.

The Accelerometer is used to detect vibration frequencies and amplitude during vehicle operation.

The optional microphone is used to record noise data during vehicle operation.

NVH ANALYZER COMPONENTS



NVH ANALYZER CHARACTERISTICS

ITEM	CHARACTERISTIC
SIZE	8.9 x 6.4 x 2.5 CM (3.5 x 2.5 x 1.0 INCHES)
WEIGHT	454 G (1 LB)
POWER	0.5 WATT
INPUT VOLTAGE	5.0 VOLTS
TESTER INTERFACE	INSTRUMENTATION PORT - CABLE LENGTH: 1.5 METER (5 FEET) - CONNECTOR: RJ45 10 PIN KEYED RIGHT
INPUTS/CONNECTORS - BNC - RCA	 USED FOR ACCELEROMETER OR MICROPHONE INPUT USED FOR PHOTO SENSOR SIGNAL INPUT (FUTURE USE)
SENSORS ACCELEROMETER	LOW-IMPEDANCE PIEZOELECTRIC - SENSITIVITY: 0.01 G - RANGE: ±1.0 G - FREQUENCY RANGE: 5-62.5Hz 5-125Hz 5-250Hz 5-500Hz - FREQUENCY ACCURACY: ±1.0% - VIBRATION LEVEL ACCURACY: ±1.5 dBg - POWER: 2 mA CONSTANT CURRENT - CABLE LENGTH: 3 METER (10 FEET)
MICROPHONE (OPTIONAL)	CERAMIC NON-DIRECTIONAL - SENSITIVITY -64 dB - FREQUENCY RANGE: 5 - 62.5Hz 5 - 125Hz 5 - 250Hz 5 - 500Hz - FREQUENCY ACCURACY: ±1% - NOISE LEVEL ACCURACY: ±1.5 db - CABLE LENGTH: 1.8 METER (5 FEET)

5.0 BREAK-OUT BOX KIT COMPONENTS

The Break-out Box kit consists of the Break-out Box, Program Card, DC Power Cable, Y-Adapter Cable, I/P Cable, 80-pin and 50-pin Data Cables, 80-pin and 50-pin Self Test Adapters, ECU Interface Boxes, and Connector Exchange Wire Sets.

The Break-out Box must be used in conjunction with the Tester.

The Program Card provides software for operating the Break-out Box.

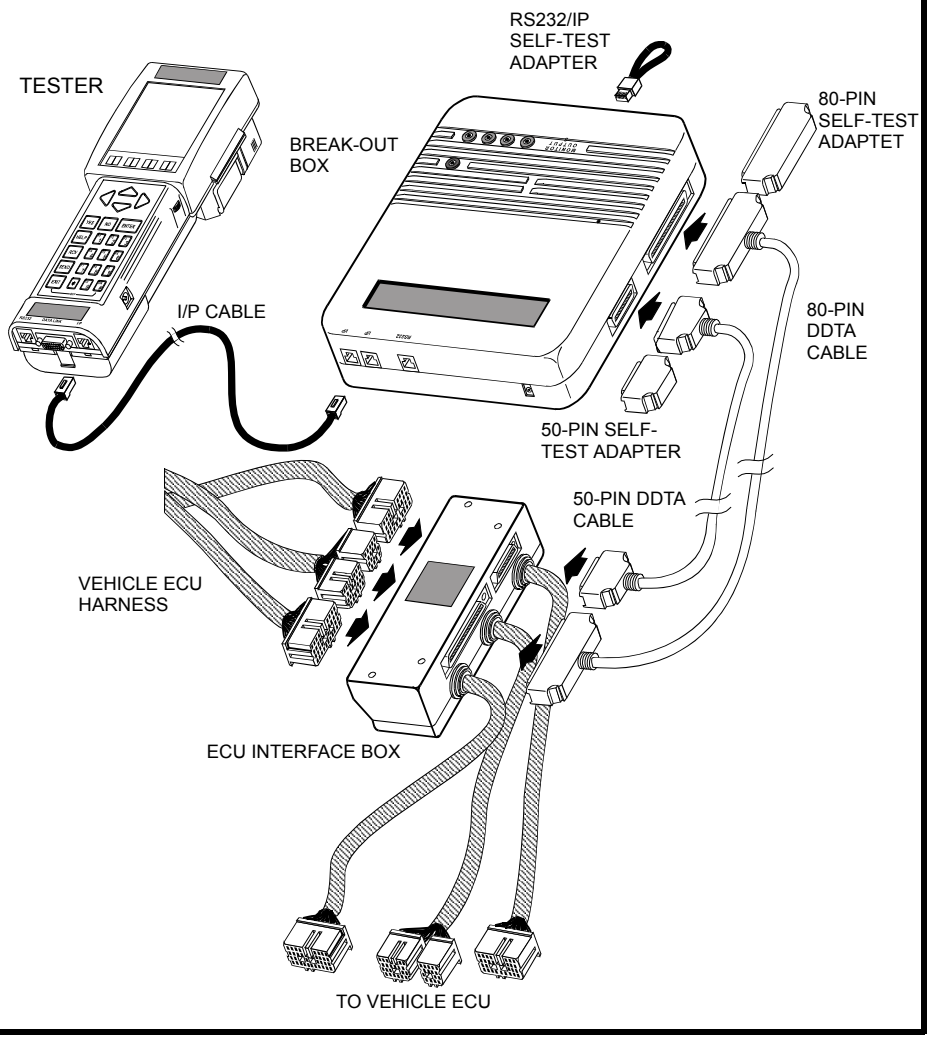
The DC Power Cable provides a means of powering the Break-out Box. A Y-Adapter Cable permits powering of both the Tester and Break-out Box from the vehicle cigarette lighter or battery adapter cable.

The I/P cable is used to connect the Break-out Box to the I/P port on the Tester.

The Break-out Box connects to the ECU Interface Box with the 50-pin and 80-pin Data Cables.

The ECU Interface Box is installed between one of the vehicle's ECUs and the vehicle wiring harness. A Connector Exchange Wire Set (not shown) is used to adapt the vehicle harness and ECU connectors for some ECUs (e.g., CCS, TDS), if necessary.

BREAK-OUT BOX COMPONENTS



BREAK-OUT BOX CHARACTERISTICS

ITEM	CHARACTERISTIC
SIZE	220 x 245 x 52 MILLIMETERS (8.7 x 9.7 x 2 INCHES)
WEIGHT	1.4 kg (3 LBS) WITH BATTERY PACK
PRIMARY POWER SOURCE	VEHICLE POWER VOLTAGE: 9 TO 24 VDC (PROTECTED AGAINST REVERSE POLARITY AND LOAD DUMP) CURRENT: 1 AMP
ALT. POWER SOURCE	REPLACEABLE NICAD BATTERY PACK
SERIAL INTERFACES	INSTRUMENTATION BUS (I/B) BAUD RATES: 2400, 4800, 9600, 19.2K, 38.4K, 57.6K, 115.2K RS232 HARDWARE HANDSHAKING (1 INPUT, 1 OUTPUT) BAUD RATES:2400, 4800, 9600, 19.2K, 38.4K
INPUT SIGNALS:	ECU INPUTS: 120 CHANNELS EXTERNAL INPUTS: 4 CHANNELS
OUTPUT SIGNALS: TEST POINTS ANALOG OUTPUTS	 4 BANANA JACKS 2 CHANNELS (CONNECTED TO I/P CONNECTOR)
INPUT SIGNAL LEVELS	2 SOFTWARE SELECTABLE INPUT RANGES LOW RANGE: ±5 V HIGH RANGE: ±40 V
INPUT IMPEDANCE	±5 V RANGE: 10 MΩ MINIMUM ±40 V RANGE: 1 MΩ MINIMUM
TYPES OF MEASUREMENT	BI-POLAR ANALOG VOLTAGE MEASUREMENTS TIMING MEASUREMENTS (FREQ., PULSE WIDTH, DUTY RATIO, ETC.)
SAMPLE RATE	VARIABLE UP TO 8,000 SAMPLES/SECOND
FREQUENCY RESPONSE	DC TO 10 KHZ
TIMING	RESOLUTION: 1 µS MINIMUM MAXIMUM FREQUENCY: 10 KHZ NO. OF CHANNELS: 6
OPERATING TEMP.	0 °C TO 50 °C (32 °F TO 122 °F)
STORAGE TEMP.	-20 °C TO 60 °C (-4 °F TO 140 °F)

FUEL CONSUMPTION FUNCTION CHARACTERISTICS (BREAK-OUT BOX)

ITEM	CHARACTERISTIC
ACCURACY	1. FUEL CONSUMPTION ± 10% (When Fuel, Fuel Pressure, and Injector are operating properly) 2. DISTANCE ± 10% 3. FUEL CONSUMPTION RATE ± 10% (When Fuel, Fuel Pressure, and Injector are operating properly) NOTE: Long distance testing is recommended to obtain higher accuracy.

1.0 ACTIVATING THE BATTERY BACKED MEMORY

FIGURE 1

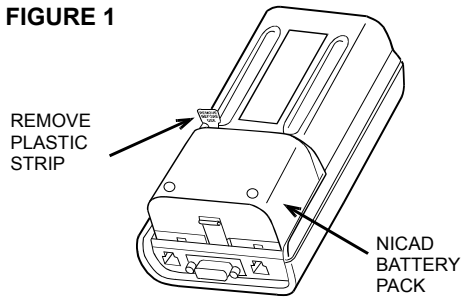


FIGURE 2

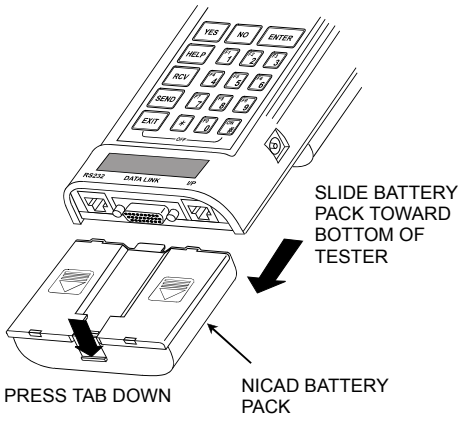
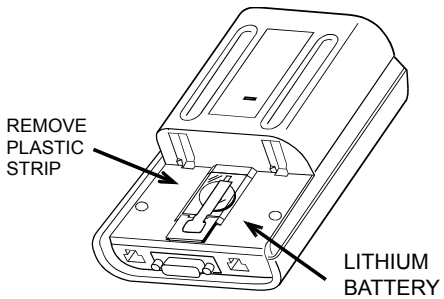


FIGURE 3



Before using the Tester for the first time, the following steps must be performed in order to activate the NiCad battery pack and the lithium battery.

1. To activate the NiCad battery pack, refer to Figure 1. Remove the plastic strip that is visible on the back of the Tester. Remove the strip completely.
2. To activate the lithium battery, refer to Figure 2 to remove the NiCad battery pack. Press on the tab at the bottom end of the battery pack while pulling the battery pack toward the bottom of the Tester.

   Refer to Figure 3 to remove the plastic strip covering the lithium battery on the back of the Tester.

   When the plastic strip is removed, slide the battery pack onto the Tester with the tab at the top in the slot on the Tester. The battery pack should lock into place. For further information, see Section *6.0 Battery Charging and Replacement on page 51*.
3. See Section *2.0 Getting Started on page 32* to install a program card in the Tester.
4. Press the (ON) key to turn the Tester on. If the Tester displays "ATTENTION! TESTER BATTERY VOLTAGE IS LOW," see Section *6.0 Battery Charging and Replacement on page 51* to charge the batteries.
5. Section *3.0 Using the Setup Mode on page 38* explains how to setup the tester's internal functions. Some of the internal functions are listed below.
   - CLOCK/CALENDAR
   - SELECT BAUD RATE
   - SELECT PRINTER
   - UNIT CONVERSION
   - BRAND SELECTION

2.0 GETTING STARTED

INSTALLING A PROGRAM CARD OR CARTRIDGE

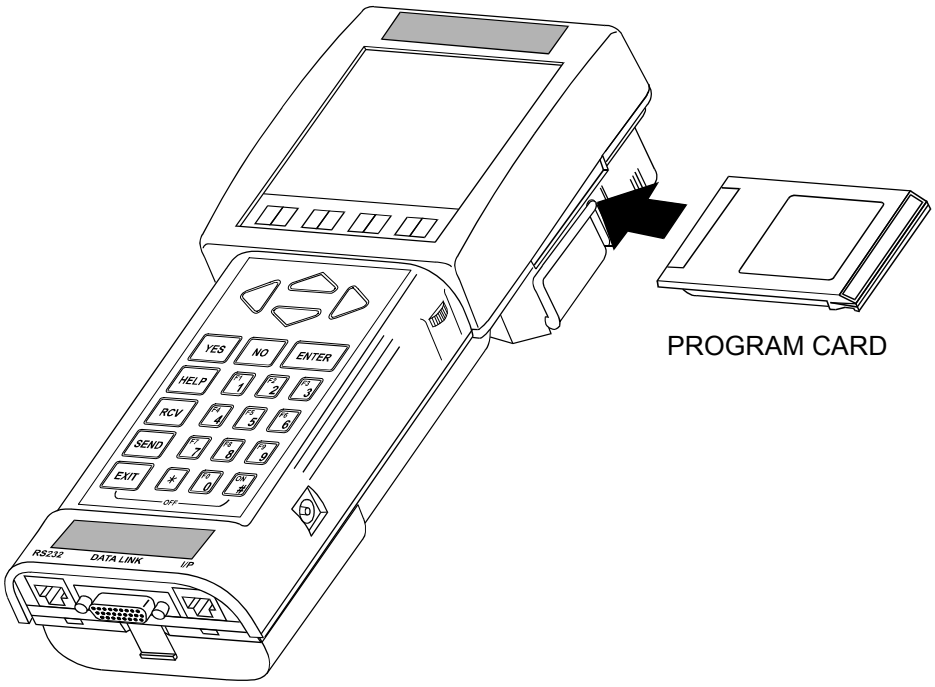
The Tester must be used in conjunction with a program card. The program card contains the software that allows the Tester to perform the tasks which are unique to diagnosing the various electronic control systems.

Be sure the Tester is off (press (#)(EXIT)) before installing or removing a program card.

PROGRAM CARD

Hold the card so the flat surface is toward the face of the Tester, then insert the card firmly into the slot located on the upper right side. The slot is keyed so the card can only be installed one way; don't force it if the cartridge doesn't slide in easily. When removing the program card, pull it straight out of the Tester without rocking it up and down.

For further information, see the chapter for the program card that you are using.



Installing a Program Card

TESTER KIT CABLES AND ADAPTERS

The Tester kit contains the following cables and adapters to connect the Tester to the vehicle:

- 14-pin to 26-pin Data Link Connector (DLC) cable
- Vehicle Interface Module (VIM)
- DLC1 (Check Connector) cable
- DLC2 (TDCL) cable
- Instrumentation Port (I/P) cable (North American kits only)

NOTE

- The RS232 cable is provided separately with the optional printer accessories.
- The I/P cable is provided with the NVH Analyzer kit and Break-out Box kit (except North American kits)

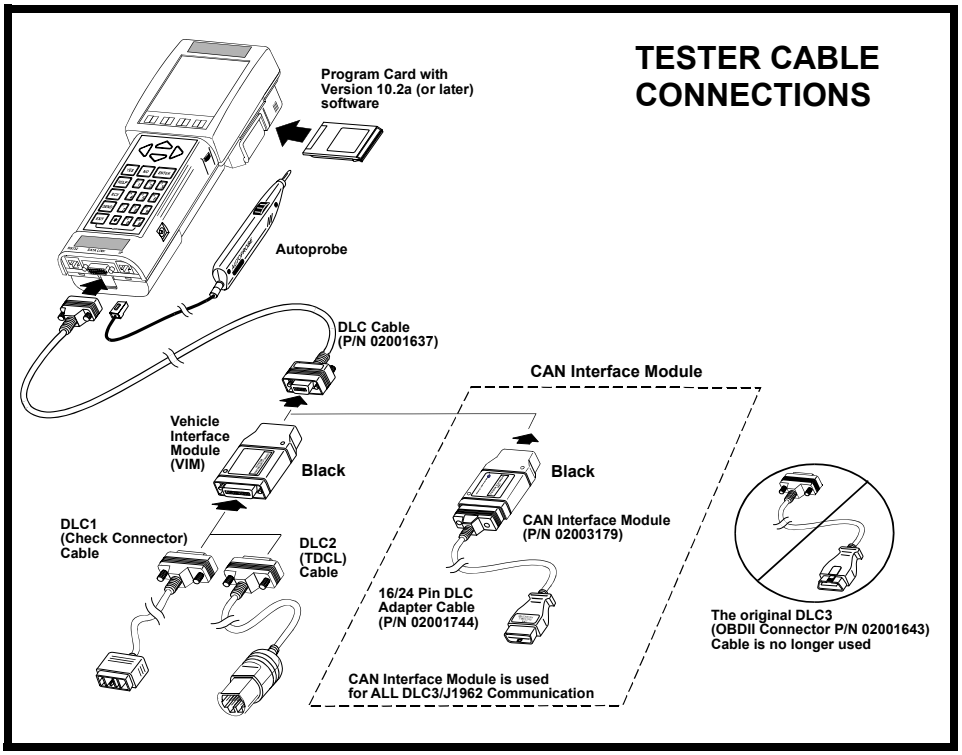
INSTALL CABLES AND ADAPTERS

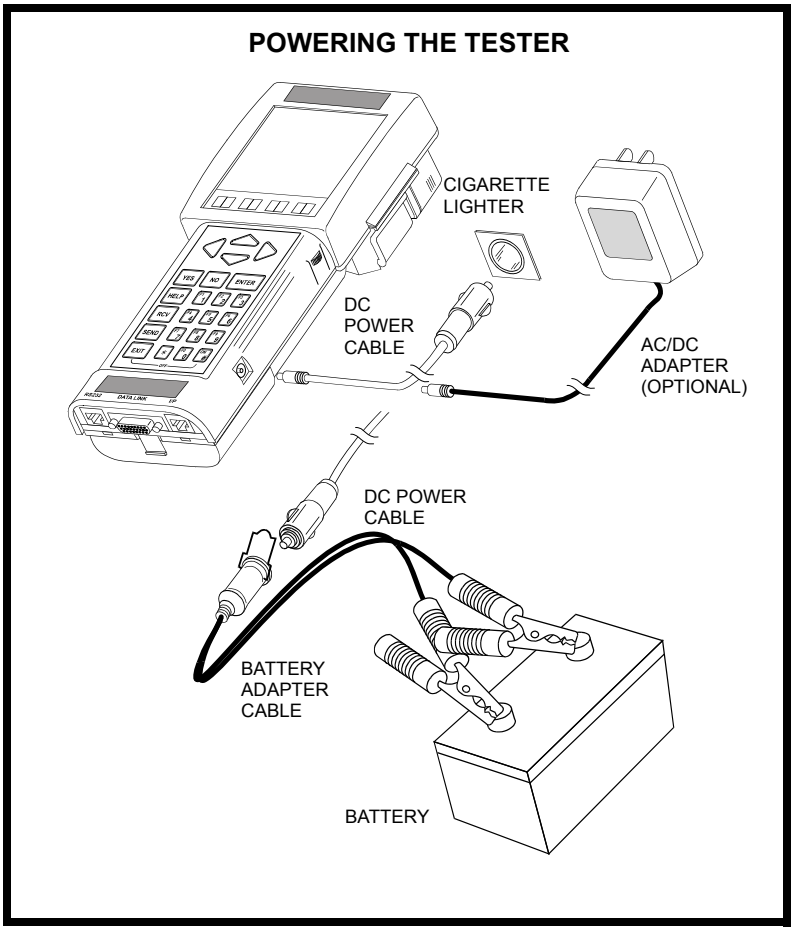
Refer to the Repair Manual or the Electrical Wiring Diagram (EWD) for the vehicle you are testing to determine which type of Data Link Connector (DLC) is provided on the vehicle.

1. Install a program card with Version 10.2 (or later) in the Tester.
2. Connect the 26-pin end of the DLC cable to the bottom of the Tester, then tighten the screws.
3. If the vehicle is equipped with a DLC3 (OBD II connector) or J1962, connect CAN Interface Module to the Tester DLC cable. Connect the other end of the CAN Interface Module to the vehicle DLC3. Proceed to Step 6.
4. If the vehicle is not equipped with a DLC3 or J1962, connect the 14-pin end of the Vehicle Interface Module (VIM) to the Tester DLC cable.
5. Depending on the model and the tests to be performed, connect either the DLC1 (Check Connector) cable or the DLC2 (TDCL) cable to the VIM.

   DLC1 (CHECK CONNECTOR) CABLE: Connect one end of the DLC1 cable to the VIM and the other end of the DLC1 cable to the underhood DLC1.

   DLC2 (TDCL) CABLE: Connect one end of the DLC2 cable to the VIM, and the other end of the cable to the DLC2 inside the vehicle.
6. Connect RS232 and Instrumentation Port devices that you plan to use to the Tester. RS232 devices, such as a printer, are connected to the bottom left side of the Tester. Instrumentation devices such as the Autoprobe, NVH Signal Conditioner, and Break-out Box connect to the bottom right side. The I/P cable connectors are 10-pin RJ45 “phone” plugs that are keyed so they fit only the correct connector.


TESTER CABLE CONNECTIONS
Program Card with Version 10.2a (or later) software
Autoprobe
DLC Cable (P/N 02001637)
CAN Interface Module
Vehicle Interface Module (VIM)
Black
Black
DLC1 (Check Connector) Cable
DLC2 (TDCL) Cable
CAN Interface Module (P/N 02003179)
16/24 Pin DLC Adapter Cable (P/N 02001744)
The original DLC3 (OBDII Connector P/N 02001643) Cable is no longer used
CAN Interface Module is used for ALL DLC3/J1962 Communication



POWERING THE TESTER

The Tester can be powered by the vehicle battery, by the AC/DC 12-volt power supply, or by the internal battery pack.

NOTE	The right green LED is illuminated when the Tester is connected to external power but has not been turned on.

VEHICLE BATTERY

•The Tester is powered directly by the DLC1 (Check Connector) cable when the DLC1 cable is connected to the underhood DLC1.

•The Tester is powered directly by the DLC3 (OBD II Connector) cable when the DLC3 cable is connected to the vehicle DLC3.

•The Tester is powered by the vehicle battery when the DC Power Cable is connected to the right side of the Tester or to the DC port on the 26-pin end of the DLC Cable, and the cigarette lighter plug is inserted into the vehicle's cigarette lighter socket or the Battery Adapter Cable.

To use the Battery Adapter Cable, connect the red clip to the positive (+) battery post and the black clip to the negative (-) post. Insert the cigarette lighter plug end of the DC Power Cable into the cigarette lighter socket on the battery adapter cable.

AC/DC 12-VOLT POWER SUPPLY

- Connect the AC/DC 12-volt power supply to the right side of the Tester, then plug the power supply into a standard wall outlet.

BATTERY PACK

- Press the (ON) key to power the Tester via the internal battery pack. When the Tester is powered by the battery pack, the display backlight will go off after one minute if there is no key press. The automatic shutoff preserves the battery charge. Once the backlight goes off, it can be turned on again by pressing any key.

NOTE	The battery pack is trickle charging when the Tester is connected to any of the power sources listed above.

ON KEY

OFF KEY

TURNING THE TESTER ON AND OFF

Connect the Tester to one of the power sources listed above, then press the (ON) key.

The battery pack allows you to turn the Tester on without being connected to external power. Press the (ON) key.

To turn the Tester off, press (#)(EXIT).

Power-up Display

POWER-UP DISPLAY

Verify that the power up display for the program card is correct. If the display is correct, follow the instructions in the program card.

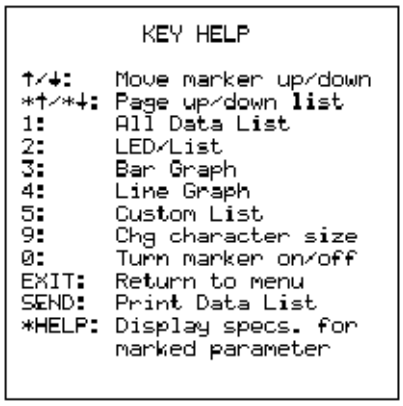
The version number and the date listed on the screen may be different from those shown in the display at the left.

If the Tester is powered up without a program card installed, the Tester displays “NO PROGRAM CARD INSTALLED.”

If the screen remains blank or something other than the Power-up screen is displayed, see *Appendix B If You Are Having A Problem on page 60*.

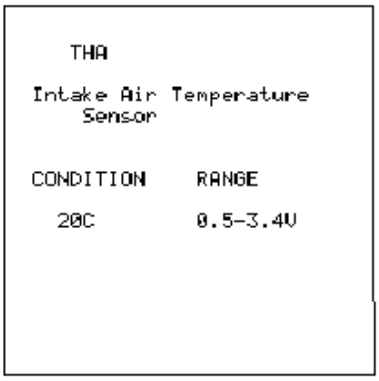
HELP SCREENS

HELP



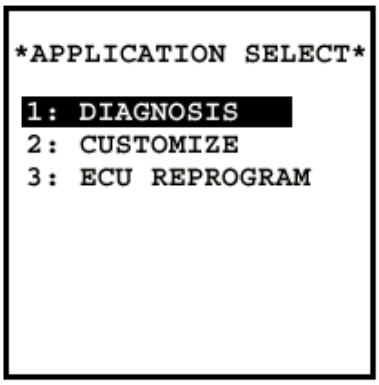
A list of the active keys for the screen displayed on the Tester is available by pressing the (HELP) key. The Help displays show which key to press to select a different mode, move the marker (cursor or highlight), print, or exit from the display. The example at the left illustrates the Key Help screen displayed when (HELP) is pressed while a Data List screen is displayed.

PARAMETER HELP



When using certain functions, such as the Break-out Box function, pressing (✱)(HELP) when a parameter is highlighted in Data List or Snapshot mode displays additional information about the highlighted signal. The display shows the parameter name, a description of the parameter, and, if available, the standard value of the parameter.

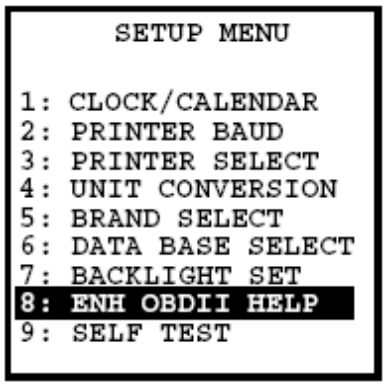
APPLICATION SELECT



Press (ENTER) to select the APPLICATION SELECT menu from the Power-up display. Select DIAGNOSIS to troubleshoot vehicles or CUSTOMIZE to uniquely configure vehicle BODY features of applicable vehicles.

ACTIVE KEYS

(1)	Selects Diagnose Application for vehicle Troubleshooting.
(2)	Selects Customize Application to configure vehicle BODY features on applicable vehicles.
(3)	Selects ECU Reprogram Application for authorized service professionals to update ECU software.
△▽	Move the highlight up or down.
(ENTER)	Select highlighted menu item.



3.0 USING THE SETUP MODE

Press (9) to select the SETUP mode from the FUNCTION SELECT MENU. The SETUP mode allows you to change the internal functions of the Tester and to perform the Tester Self-Tests.

ACTIVE KEYS

(1) Sets the time and date functions.
(2) Sets up the Tester to send data to a printer.
(3) Select the printer type.
(4) Selects the units of measurement for displaying data:
- ° C or ° F for temperature
- km/h or MPH for vehicle speed
- kPa, in. Hg, or mmHg for pressure

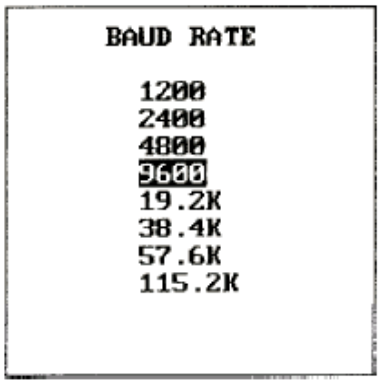
(5) Selects the brand of vehicle being tested.
(6) Selects Database Source.
(7) Selects the default backlight setting.
(8) Selects the Enhanced OBDII *-Help option.
(9) Selects the SELF-TEST MENU.
△▽ Moves the cursor (highlight) up and down.
(ENTER) Selects the highlighted menu item.

CLOCK/CALENDAR

Press (1) from the SETUP MENU to select the CLOCK/CALENDAR mode, which allows you to set the date and time.

ACTIVE KEYS

(0)-(9) Enter the digit numbers for the date and time.
(YES) Changes from AM to PM or from PM to AM.
(ENTER) Starts the clock and returns to the SETUP MENU.
△▽ Moves highlight up or down.
◁▷ Moves highlight left or right.



BAUD RATE

Press (2) from the SETUP MENU. The baud rate of the printer you are using is selected. The baud rate information is included in the Operator's Manual for the printer.

NOTE	The default baud rate setting for the optional VP-411/414 printer is 9600 baud.

ACTIVE KEYS

△▽ Moves the cursor (highlight) up and down to select the baud rate.
(EXIT) Saves the baud rate for the printer and returns to the SETUP MENU.
(ENTER) Saves the baud rate for the printer and returns to the SETUP MENU.

PRINTER SELECT

Press (3) from the SETUP MENU to display a list of printer types that can be used with the Tester.

NOTE	The default setting is Printer Type 2, which operates the optional VP-411/414 printer. If you are using a printer other than the VP-411/414, connect the printer to the Tester and try to print. If the printer does not print, select a different printer type and try again.

ACTIVE KEYS

△▽ Moves the cursor (highlight) up and down to select a printer.
(EXIT) Saves the selected printer and returns to the SETUP MENU.
(ENTER) Saves the selected printer and returns to the SETUP MENU.

UNIT CONVERSION

Press (4) from the SETUP MENU to select the UNIT CONVERSION mode. Use the arrow keys to highlight the preferred units of measurement for displaying data, then press (ENTER). Not all conversions are available for all models or systems.

ACTIVE KEYS

△▽ Moves the cursor (highlight).
◁▷
(ENTER) Saves the selected units and returns to the SETUP MENU.

BRAND SELECTION

Press (5) from the SETUP MENU to select the Brand Selection function. Use the up and down arrows to move the highlighted cursor between options. Press (ENTER) to configure the Tester to display the requested vehicles during the vehicle selection process.

ACTIVE KEYS

△▽ Moves the cursor (highlight).
(ENTER) Configures the Tester for the highlighted brand.

DATABASE SELECT

Press (6) from the SETUP MENU to select the Vehicle Database. Use the arrow keys to select the Database.

NOTE	You must exit to the POWER-UP DISPLAY for the function to work properly.

ACTIVE KEYS

↑↓	Moves the cursor (highlight) up and down to select a database.
ENTER	Selects the highlighted menu item.

NOTICE
When the Database Selection has been changed, it is necessary to exit all the way to the Power-Up Display Screen for proper results.
Press <ENTER>

APPLICATION SELECT MENU ENABLE / DISABLE

Press (7) from the SETUP MENU to select APP SELECT MENU ENABLE / DISABLE. To skip the APPLICATION SELECT menu at Power-up and go straight to the Diagnostic Application, select DIAGNOSTIC ONLY. To display the APPLICATION SELECT MENU at Power-up, select DIAG AND CUSTOM. See *Getting Started on page 32*.

NOTE	You must exit to the Power-up Display for the function to work properly.

ACTIVE KEYS

(1)	Selects DIAGNOSTIC ONLY to disable the Application Select Menu.
(2)	Selects DIAG AND CUSTOM to display the Application Select Menu at Power-up.
↑↓	Moves the cursor (highlight) up or down to select an option.
ENTER	Selects the highlighted menu item.

NOTICE
When the App Menu Selection has been changed, it is necessary to exit all the way to the Power-Up Display Screen for proper results.
Press <ENTER>

BACKLIGHT SET

Press (8) from the SETUP MENU to change the Power-up backlight setting.

NOTE	The # - (YES) hotkey sequence does not change the Power-up setting

E-OBDII HELP SELECTION

Press (8) from the SETUP MENU to select the *–Help option for ENHANCED OBDII.

NOTE	To enable *–HELP, a vehicle selection process is required.

ACTIVE KEYS

◁▷ Toggles between *–HELP ENABLED/DISABLED.
(ENTER) Saves setting and return to menu.

SELF-TESTS

The Self-Tests check the following Tester:

- Display/LEDs
- Keyboard
- Sound
- Memory/Internal Circuits
- Data Link
- Autoprobe
- RS232 port
- Instrumentation port

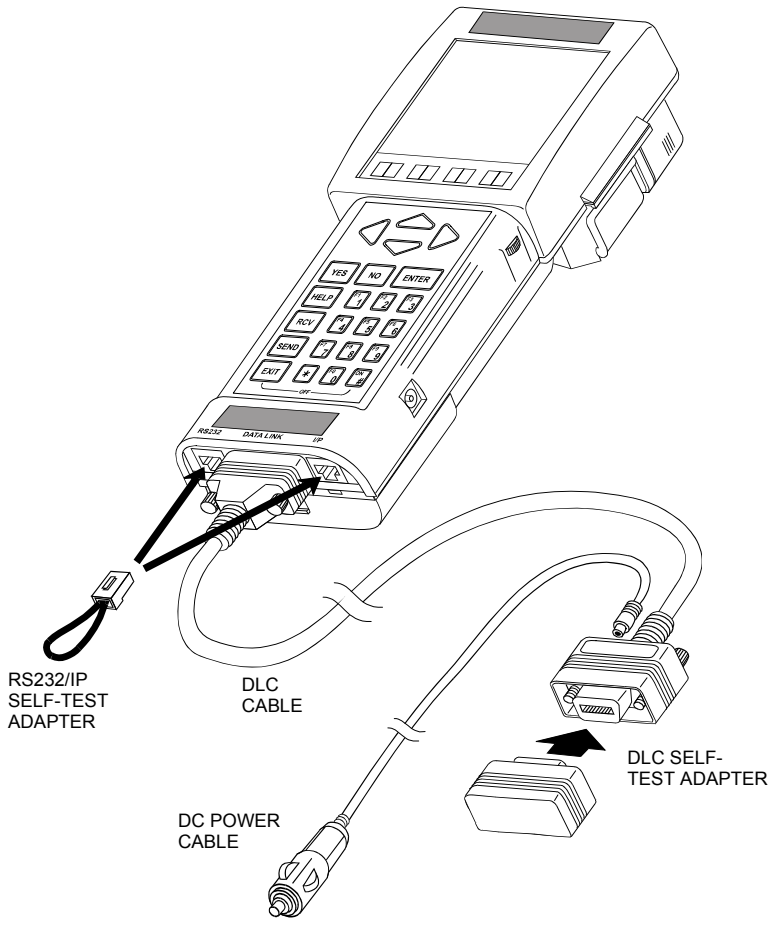
If the Tester does not pass all of the tests, double check that the Self-Test Adapters (required for certain tests) are properly installed and making good contact during the testing.

- Self-Test Adapters are used for the following tests:

TEST	ADAPTER
DLC CABLE	DLC SELF-TEST ADAPTER
RS232 and INST PORT	RS232/IP SELF-TEST ADAPTER

NOTE	Do not connect the DLC cable to the vehicle while the Self-Test is being performed.

SELF-TEST SETUP

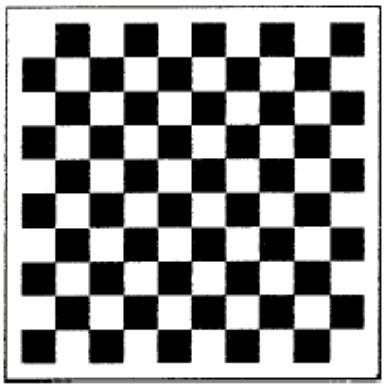


SELF-TEST MENU

Press (9) to select the SELF-TEST mode from the SETUP MENU and display the SELF-TEST MENU. The SELF-TEST mode allows you to perform any of a series of nine Self-Tests.

ACTIVE KEYS

(1) Displays a checkerboard pattern, and cycles the LEDs on and off.
(2) Tests for proper operation of the keyboard.
(3) Instructs you to press the 0-9 keys to play sound.
(4) Checks the integrity of many of the critical circuits inside the Tester and the program card inserted in the Tester.
(5) Checks the DLC and the DLC cable.
(6) Tests internal circuits of the Autoprobe
(7) Checks for proper operation of the RS232 Port (printer connector).
(8) Checks for proper operation of the Instrumentation Port (Autoprobe connector).
(9) Displays the production dates of the program card, the Tester resident program, and the Tester I/O resident program.
△▽ Moves the cursor (highlight) up and down.
(ENTER) Selects the highlighted menu item.



DISPLAY/LED

Press (1) to select the DISPLAY/LEDs test from the SELF-TEST MENU. This test checks the LCD and LED displays.

ACTIVE KEYS

(ENTER) Changes the LCD display.
(EXIT) Returns to the SELF-TEST MENU.

KEYBOARD

Press (2) to select the KEYBOARD test from the SELF-TEST MENU. This test checks for proper operation of the keyboard keys.

ACTIVE KEYS

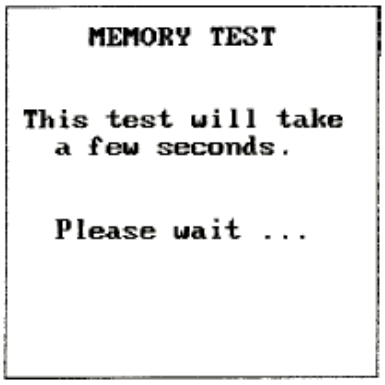
All Keys Selects the key to highlight.
(*)(EXIT) Returns to the SELF-TEST MENU.

SOUND

Press (3) to select the SOUND test from the SELF-TEST MENU. Press (0) - (9) to play sound.

ACTIVE KEYS

(0) - (9) Plays sound.
(EXIT) Returns to the SELF-TEST MENU.



MEMORY

Press (4) from the SELF-TEST MENU to select the MEMORY test. The MEMORY test checks the integrity of many of the critical circuits inside the Tester.

ACTIVE KEY

(EXIT) Returns to the SELF-TEST MENU.

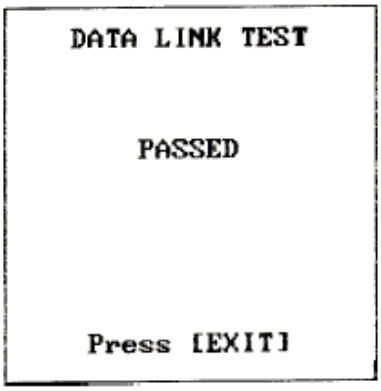
DATA LINK

Press (5) to select the DATA LINK test from the SELF-TEST MENU. The DATA LINK test checks for proper operation of the DLC cable.

NOTE	When this test is selected, you are instructed to install the 14-pin DLC Self-Test Adapter on the end of the DLC cable.

ACTIVE KEY

(ENTER) Runs the test.



The DATA LINK test result is displayed.

ACTIVE KEY

(EXIT) Returns to the SELF-TEST MENU.

AUTOPROBE

Press (6) to select the Autoprobe test from the SELF-TEST MENU. The Autoprobe test checks the internal circuits of the Autoprobe.

ACTIVE KEY

(ENTER) Starts the Autoprobe switch test.

1. Press the Autoprobe switch to test.
2. PASSED" is displayed if the Autoprobe switch is operating properly.

ACTIVE KEY

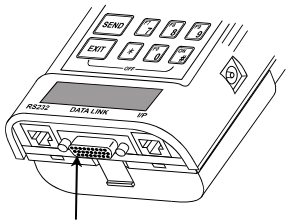
(ENTER) Starts the Autoprobe switch Self-Test.

```
AUTOPROBE TEST

Touch the probe tip
 to the metal shell
   of any of the
 connectors on the
base of the tester.


   Press [ENTER] if
     no response.
```

3. .Touch the probe tip to the metal surface of any of the connectors on the base of the Tester.

ACTIVE KEY

(ENTER) If the display does not change, the Autoprobe has failed the Self-Test. Press (ENTER) to return to the SELF-TEST MENU.




```
AUTOPROBE TEST

    PASSED


   Press [EXIT]
```

4. "PASSED" is displayed if the Autoprobe is functioning properly. "FAILED" is displayed if the (ENTER) key was pressed in Step 3. Press (EXIT) to return to the SELF-TEST MENU.

ACTIVE KEY

(EXIT) Returns to the SELF-TEST MENU.

```
RS232 TEST

  Install the
  RS232/IP
SELF TEST ADAPTER
  in the RS232
connector on the
left side of the
base of the tester.

  Press [ENTER]
```

RS232

Press (7) to select the RS232 test from the SELF-TEST MENU. The RS232 test checks for proper operation of the RS232 Port.

NOTE	When this test is selected, you are instructed to install the RS232/IP Self-Test Adapter in the RS232 Port.

1. Install the RS232/IP Self-Test Adapter. The Tester checks the RS232 Port.

ACTIVE KEY

(ENTER) Runs the test.

```
RS232 TEST

    PASSED


   Press [EXIT]
```

The RS232 TEST result is displayed.

ACTIVE KEY

(EXIT) Returns to the SELF-TEST MENU.

INSTRUMENTATION PORT

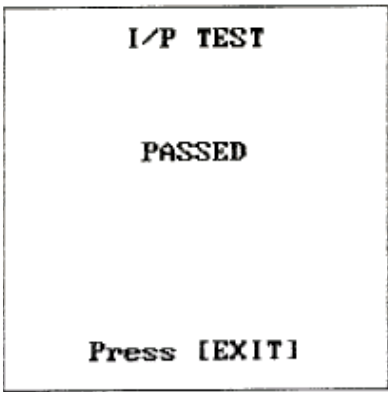
Press (8) to select the INSTRUMENTATION PORT test from the SELF-TEST MENU. The I/P TEST checks for proper operation of the I/P (Instrumentation Port) connector.

NOTE	When this test is selected, you are instructed to install the RS232/IP Self-Test Adapter in the I/P connector .

1. Install the RS232/IP Self-Test Adapter, then press (ENTER). The Tester checks the Instrumentation Port connector.

ACTIVE KEY

(ENTER) Runs the test.

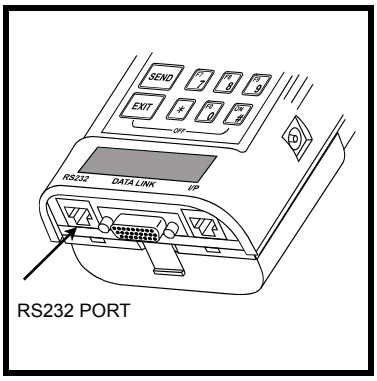


The I/P TEST result is displayed.

ACTIVE KEY

(EXIT) Returns to the SELF-TEST MENU.

4.0 USING THE RS232 PORT, INSTRUMENTATION PORT, AND AUTOPROBE



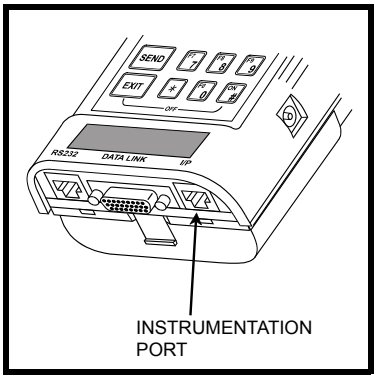
RS232 PORT

RS232 PORT

The RS232 port is a standard connection for communication between computers and computer peripherals such as printers. RS232 compatible equipment may be connected to the RS232 port via the 10-pin RJ45 connector located at the bottom left end of the Tester.

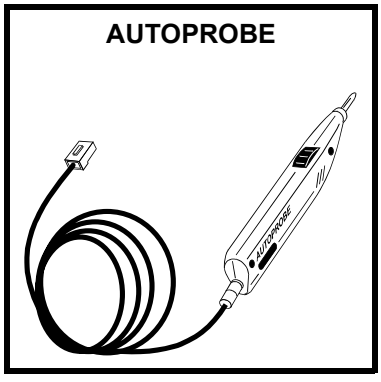
The operation of the RS232 functions are dependent on the program card and the RS232 device being used. Operating procedures for these functions are included in the chapters for the program card or the RS232 device.

NOTE	One RS232 function which is common to all program cards is the Screen Print function. If you are using a compatible RS232 graphic printer, you can print what is displayed on the Tester screen by pressing (#)(SEND).



INSTRUMENTATION PORT

The Instrumentation Port connection is a 10-pin RJ45 phone plug connector on the bottom right of the Tester. The Instrumentation Port supports the use of the Autoprobe, NVH Analyzer, Break-out Box ,and other I/P devices.



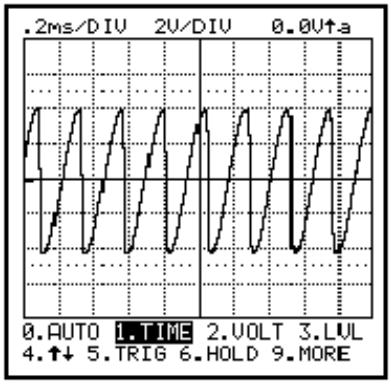
AUTOPROBE

Connect the Autoprobe cable to the I/P connector on the bottom right end of the Tester. The Autoprobe provides the following test capabilities:

DVM FUNCTIONS

Volt Meter
Frequency Counter (frequency, duty cycle)
Oscilloscope

NOTE	The Autoprobe provided in the Tester kit is only intended for automotive-type signal measurement. It is not a lab-quality Digital Volt Ohm Meter (DVOM).



OSCILLOSCOPE DISPLAY

OSCILLOSCOPE FUNCTIONS

The Oscilloscope can display vehicle signals and voltages. Additionally, the Break-out Box function uses the oscilloscope function to display any ECU signal which is available from the Break-out Box.

The Oscilloscope and Autoprobe can measure voltage from -20 volts to +20 volts and frequency from 0-5 KHz for frequency counter and 0-10 KHz for oscilloscope.

NOTE	The oscilloscope function is intended for automotive-type signal measurement and is not a lab-quality oscilloscope.

Refer to the OBD Operator's Manual for detailed Autoprobe and Oscilloscope operating instructions.

5.0 FINISHING UP

After using the Tester, a few simple steps will help you leave the vehicle electronics in the proper state and also ensure that you get the most use out of your diagnostic tools:

1. Reconnect hoses, connectors, spark plug wires, fuel lines, etc. that were disconnected from the vehicle during testing.
2. Before turning the Tester off, clear any Diagnostic Trouble Codes that may have been set during the course of troubleshooting the vehicle electronics.
3. Remove power to the Tester by unplugging the DC power cable.
4. Disconnect the tester's connecting cables from the vehicle.
5. Turn the Tester off by pressing (#)(EXIT).
6. The program card may be stored in the Tester, or removed and stored in the program card slot in the storage case.

HINT	If the Tester is turned on without a program card installed, or with a different program card installed, the data stored in the Tester memory, such as Snapshot data, will be lost.

7. Inspect the cables, connectors, and cigarette lighter for damage and corrosion.
8. Store the Tester, cables, and adapters in the storage case.

CLEANING AND STORING YOUR TESTER

NOTE	If the Tester, probe, or cables become dirty, they may be cleaned by wiping them with a rag lightly coated with a mild detergent or non abrasive hand soap. Do not immerse the Tester, Autoprobe, or cables in water. Avoid using harsh solvents such as petroleum based cleaning agents, Acetone, Benzene, Trichloroethylene, etc. Although the Tester and Autoprobe are water resistant, they are not waterproof; thoroughly dry them prior to storage.

Always clean the Tester screen by wiping vertically only. Never use a circular motion on clear plastics.

6.0 BATTERY CHARGING AND REPLACEMENT

The Tester contains two types of batteries: a set of rechargeable nickel-cadmium (NiCad) batteries and a replaceable lithium battery.

NICAD BATTERY PACK

The NiCad batteries are housed in a removable battery pack located on the bottom underside of the Tester. For normal use the Tester should be powered from the vehicle's cigarette lighter or battery adapter cable, or by the AC/DC 12-volt adapter. However, on some vehicles power is not available at the cigarette lighter when the ignition is off or when the engine is cranking. The NiCad battery pack provides power to the Tester under these conditions. When fully charged, the battery pack can power the Tester for up to one hour.

Always turn the Tester off when not in use!

To confirm that the battery pack is sufficiently charged for testing:

1. Turn the Tester on (press (ON)) before connecting the Tester to an external power source such as the vehicle battery or AC/DC 12-volt adapter.
2. If the Power-up screen is displayed for one minute, the battery pack probably has enough charge to test a vehicle.

EXAMPLE OF
POWER UP DISPLAY

3. If the screen on the left is displayed within one minute of powering up the Tester with the battery pack or if this screen appears during testing, the NiCad battery pack requires charging.

LOW BATTERY
WARMING DISPLAY

CHARGING THE BATTERY PACK

The Tester constantly charges the NiCad battery pack as long as it is connected to a 12 VDC power source. In normal use, the Tester keeps the battery pack adequately charged. However, if the Tester is used for extended periods of time with the vehicle ignition off, or stored for an extended period of time without use, the NiCad battery pack may become discharged.

To recharge the battery pack, connect the Tester to a 12 VDC power source such as the vehicle battery or the 12-volt AC/DC power supply or remove the six batteries from the battery pack and recharge the individual cells in a commercially available AA cell NiCad battery charger. It takes approximately 16 hours to fully recharge the battery pack. However, 4 hours of charging time provides a partial charge and allows approximately 30 minutes of Tester operation.

Remember, the battery pack is required only when power is not available at the cigarette lighter socket. If the battery pack is not charged and you need to use the Tester, simply connect the Tester directly to the vehicle's battery with the Battery Adapter Cable and cigarette lighter DC power cable supplied with the Tester kit. This allows operation of all diagnostic procedures with the Tester and starts recharging the battery pack at the same time.

It is recommended that the battery pack be charged overnight using the AC/DC power supply at least once a week (or more often if required). You can't charge the battery pack too often.

If "ATTENTION! TESTER BATTERY VOLTAGE LOW" is displayed after the battery pack has been properly charged, then the NiCad batteries are not capable of being recharged and must be replaced.

REPLACING THE NICAD BATTERIES

The capacity of the NiCad batteries decreases over time and needs to be replaced periodically. The six batteries originally equipped with the Tester are 1.2-volt High Capacity 700 milliampere hour (mAh), AA size, NiCad rechargeable batteries. This type of battery is available at certain electronic supply stores, or may be ordered from the nearest Vetronix Service Center listed in the Introduction. Lower capacity batteries (500 mAh) can also be used in place of the high capacity type. (Note: Do not mix high capacity and low capacity NiCad cells within the battery pack.) When replacing NiCad batteries, always replace all six cells for maximum battery life.

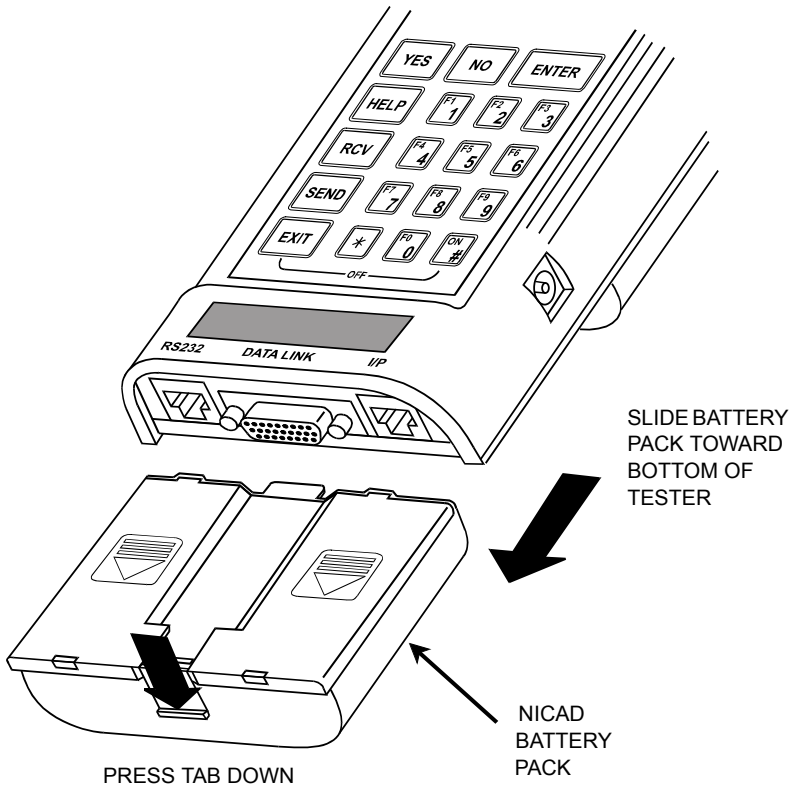
CAUTION!

Only use NiCad rechargeable batteries in the Tester battery pack. Other types of batteries may burst causing personal injury and damage to the Tester.

To replace the batteries, do the following:

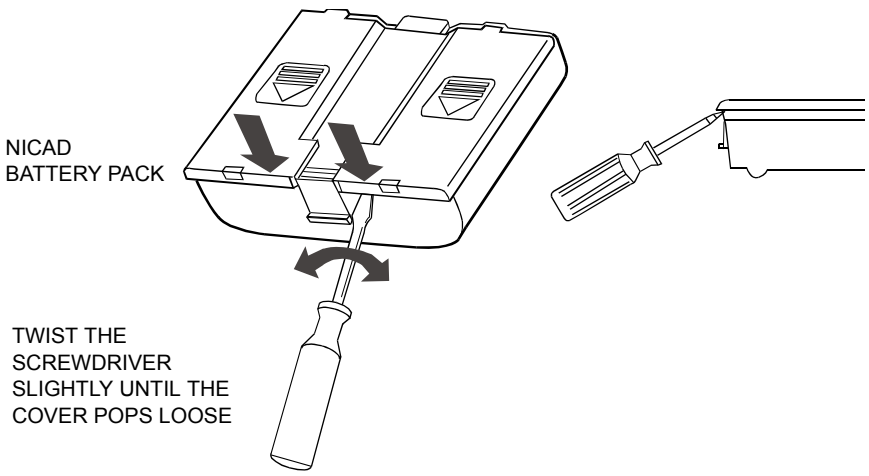
1. Disconnect the power supply cable from the vehicle and from the Tester.
2. Press (#)(EXIT) to turn the Tester off.
3. Press the tab at the bottom end of the battery pack while pulling the battery pack toward the bottom of the Tester.

REMOVING THE BATTERY PACK



4. To remove the battery pack cover, grasp the battery pack with one hand and position a screwdriver (flat blade) as shown in the figure below. Push the screwdriver blade against the battery pack side wall and the battery cover. While pushing, twist the screwdriver slightly until the cover pops loose from the locking tabs. Repeat for the other side.

REMOVING THE BATTERY PACK COVER



5. Remove the six NiCad batteries.

ATTENTION!

CAUTION

NiCad batteries are recyclable. Under various state and local laws it may be illegal to dispose of NiCad batteries in the municipal waste system. Check with local solid waste officials in your area for recycling options or proper disposal methods.

6. Install the new batteries with the positive (+) and negative (-) terminals oriented as indicated on the inside of the battery pack.
7. Place the cover on the battery case so the tabs at the top of the cover are aligned with the slots in the case, and the slots at the bottom of the cover are aligned with the tabs on the case.
8. Press the arrows on the battery cover while pushing the cover toward the top of the case. The cover should snap into place.
9. Slide the battery pack onto the Tester so the tab at the top fits into the slot on the Tester. The battery pack should lock into place.

```
     ATTENTION!
SETUP INFORMATION
FOR CARD NOT FOUND
SETUP IS REQUIRED

Possible causes:
■ New program card
■ Internal lithium
  battery replaced
  or dead

  Press [ENTER]
```

LITHIUM BATTERY

The lithium battery, located on the underside of the Tester behind the NiCad battery pack, enables the Tester to retain setup information and data in its memory without being connected to an external power source.

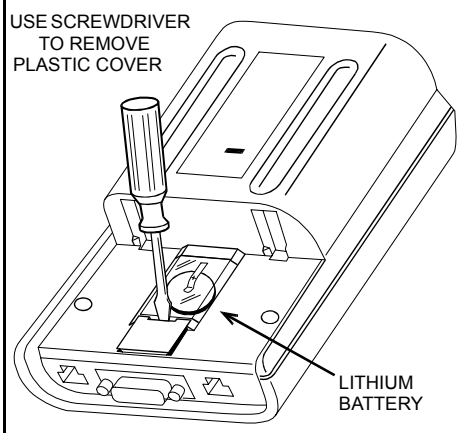
The lithium battery should last approximately two years before replacement is necessary. The Tester displays the screen at left when the lithium battery is discharged (dead) or a new battery has just been installed. This screen is also displayed if the plastic strips are not removed before operating the Tester for the first time.

REPLACING THE LITHIUM BATTERY

The lithium battery is a standard 3-volt battery which must be replaced with a Sanyo CR2032 (or equivalent) battery when it becomes discharged.

1. Disconnect the power supply cable from the vehicle and from the Tester.
2. Press (#)(EXIT) to turn the Tester off.
3. The round lithium battery is located under a plastic cover beneath the battery pack on the back of the Tester.
4. To remove the NiCad battery pack, press the tab at the end of the battery pack while pulling the battery pack toward the bottom of the Tester.

REMOVING THE LITHIUM BATTERY



5. To remove the lithium battery compartment plastic cover, use your fingernail or a small screwdriver to lift the bottom end of the cover away from the Tester.
6. To remove the battery, slide the battery from under the metal strap that holds the battery in place. Note that the plus (+) side of the battery is toward you. DO NOT PRY UP ON THE METAL STRAP.
7. Remove the battery.
8. To install the new battery, slide the battery under the metal strap so the plus (+) side is facing you. DO NOT PRY UP ON THE METAL STRAP.
9. Install the plastic cover so the two plastic tabs on one end of the cover are hooked into the opening toward the top of the Tester.
10. Press on the bottom end of the plastic cover until it snaps into place.
11. Slide the battery pack onto the Tester so the tab at the top fits into the slot on the Tester. The battery pack should lock into place.
12. Perform the Setup procedure described in Section *3.0 Using the Setup Mode on page 38*.

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APPENDICES

A. UNDERSTANDING RS232 COMMUNICATIONS

B. IF YOU ARE HAVING A PROBLEM

C. GLOSSARY AND ABBREVIATIONS

A. UNDERSTANDING RS232 COMMUNICATIONS

RS232 is a standard in the computer industry for serial communications between computers and peripheral devices. Virtually all small computer systems have at least one RS232 port. RS232 links are used to communicate with printers, display terminals, modems, and many types of test equipment.

An RS232 communication link is a serial link as opposed to a parallel link. This means that data is transmitted serially, one bit after another, over a single data line versus a number of bits being transmitted simultaneously using multiple data lines as is done in a parallel link. Remember that the RS232 connection will not work with a device which uses parallel data. This is important since most printers connected to small computer systems are parallel printers and will not work with the Tester.

Specifications for the RS232 link are provided on the following page. You should not need to use this information unless you are trying to connect the Tester to a device other than those discussed in this manual.

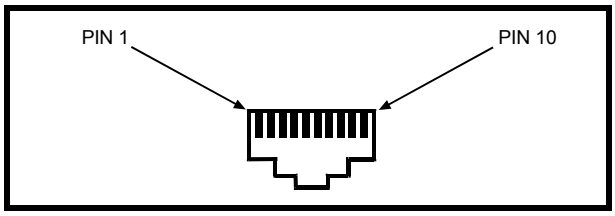
If you are trying to connect an RS232 compatible device to the Tester, you must make sure that you set it up so that it can communicate with the Tester. If you're having problems, refer to the RS232 Interface Signal Specifications and use the following check list:

- Make sure the cable is connected.
- Make sure the other device is "On Line".
- Make sure the baud rates are the same.
- Make sure the data format is the same.
- Make sure that the signals are connected appropriately between the two devices (the RS232 Transmit signal must be connected to the other device's Receive line and vice versa).

RS232 INTERFACE SIGNALS

PIN NUMBER	SIGNAL NAME	INPUT/ OUTPUT	CONNECT TO
1	NOT USED		
2	DTR	OUTPUT	DSR
3	CARRIER DETECT	INPUT	CARRIER DETECT
4	CTS	*	RTS
5	TRANSMIT	OUTPUT	RECEIVE
6	RECEIVE	INPUT	TRANSMIT
7	RTS	*	CTS
8	SIGNAL GROUND		SIGNAL GROUND
9	DSR	INPUT	DTR
10	NOT USED		

* CTS and RTS are connected together inside the Tester, but are not used as handshake signals by the Tester.



RS232 SOCKET ON TESTER
(RJ45 10-PIN MODULAR PHONE CONNECTOR)

SIGNAL LEVELS:
LOGIC “1” - 12 V
LOGIC “0” +12 V

DATA FORMAT:
1 START BIT
8 DATA BITS
1 STOP BIT
NO PARITY

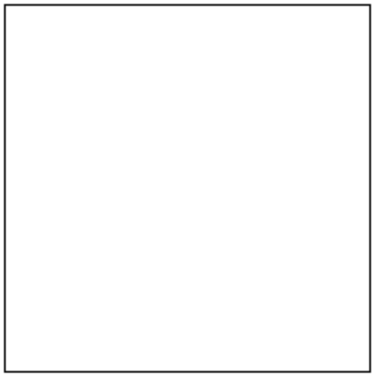
BAUD RATES:

SOFTWARE SELECTABLE:
1200 bps
2400 bps
4800 bps
9600 bps
19200 bps
38400 bps
57600 bps
115200 bps

B. IF YOU ARE HAVING A PROBLEM

If you have a problem using the Tester and the program card, first select SETUP 9: SELF-TEST from the SETUP MENU and perform all of the Self-Tests.

This section is intended to help you get back on track if the Tester appears to be operating abnormally. Examples of most of the displays which you might see under abnormal conditions are shown. In addition, the most likely cause for the condition is given as well as other possible causes and recommendations on how to isolate or eliminate the problem. If your problem is not isolated or eliminated by using these instructions, see WARRANTY AND REPAIR INFORMATION in the Introduction section.



Blank screen is displayed when the Tester is turned on

MOST LIKELY CAUSE:

- Display contrast misadjusted.
- NiCad batteries dead and Tester is not receiving power from vehicle.
- Fuse in cigarette lighter plug is blown.

RECOMMENDATIONS:

- Adjust Tester contrast control.
- Charge NiCad batteries.
- Inspect the Tester DC power cable and plug.
- Replace fuse in cigarette lighter plug.

Error message is displayed

MOST LIKELY CAUSE:

- Vehicle ignition switch is turned off.
- Tester not connected to vehicle.
- DLC adapter cable is malfunctioning.
- Vehicle Interface Module, Check Connector, or TDCL cables are malfunctioning.
- Loose connections.

RECOMMENDATIONS:

- Make sure vehicle ignition switch is in the ON position.
- Disconnect and reconnect the cable, making sure the connector is properly connected.

Printer cannot print by pressing SEND and #SEND keys

MOST LIKELY CAUSE:

- Printer is turned off.
- Printer is out of paper.
- Printer cable connections are loose or cable is open.
- Printer is malfunctioning.
- Printer setup is incorrect.
- Incompatible printer.

RECOMMENDATIONS:

- Turn the printer power on.
- Verify that the printer baud rate is the same as the baud rate of the Tester.
- Set paper on the printer.
- Make sure the printer cable is connected securely; replace printer cable as needed.
- Run the printer self-test or print to test.
- See Section 3.0 to setup the printer.

The Tester does not pass all of the self-tests

MOST LIKELY CAUSE:

- Tester is not receiving power from vehicle.
- Loose connections.
- Program card is not installed.
- Tester is connected to the vehicle Check Connector or TDCL.
- Cigarette lighter socket or plug fuse is blown.

RECOMMENDATIONS:

- Check that the cable is securely attached to the Tester.
- Check that the DLC cable connector pins are clean.
- Check the fuse for the cigarette lighter socket and the fuse in the cigarette lighter plug. Replace the fuses if necessary.
- Double check that the appropriate test adapter (required for certain tests) is properly installed and making good contact during the testing.

Tester does not power up when connected to the vehicle battery via the cigarette lighter or battery adapter cable

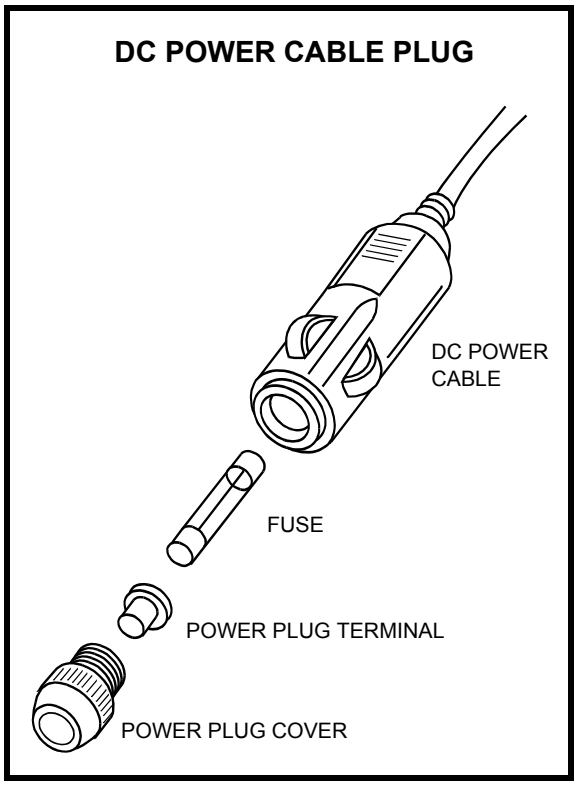
MOST LIKELY CAUSE:

- DC power cable not making good contact.
- Vehicle cigarette lighter fuse is blown.
- Fuse in DC power cable cigarette lighter plug is blown.

RECOMMENDATIONS:

- Disconnect and reconnect the DC power cord. Verify that the power cord is connected properly.
- Replace vehicle cigarette lighter fuse.
- Replace fuse in DC power cable cigarette lighter plug as follows:

1. Disconnect the DC power cable from the Tester.
2. A 3A fuse is built into the power plug on the DC power cable. Check and replace the fuse as follows:
   A. Remove the power plug cover and remove the fuse together with the spring. The spring and power plug terminal can pop out so take care not to lose them.
   B. Check the fuse and replace it if necessary.
   C. Install the fuse and spring into the power plug.
   D. Check that the power plug terminal is inside the power plug cover, then screw the cover onto the power plug.



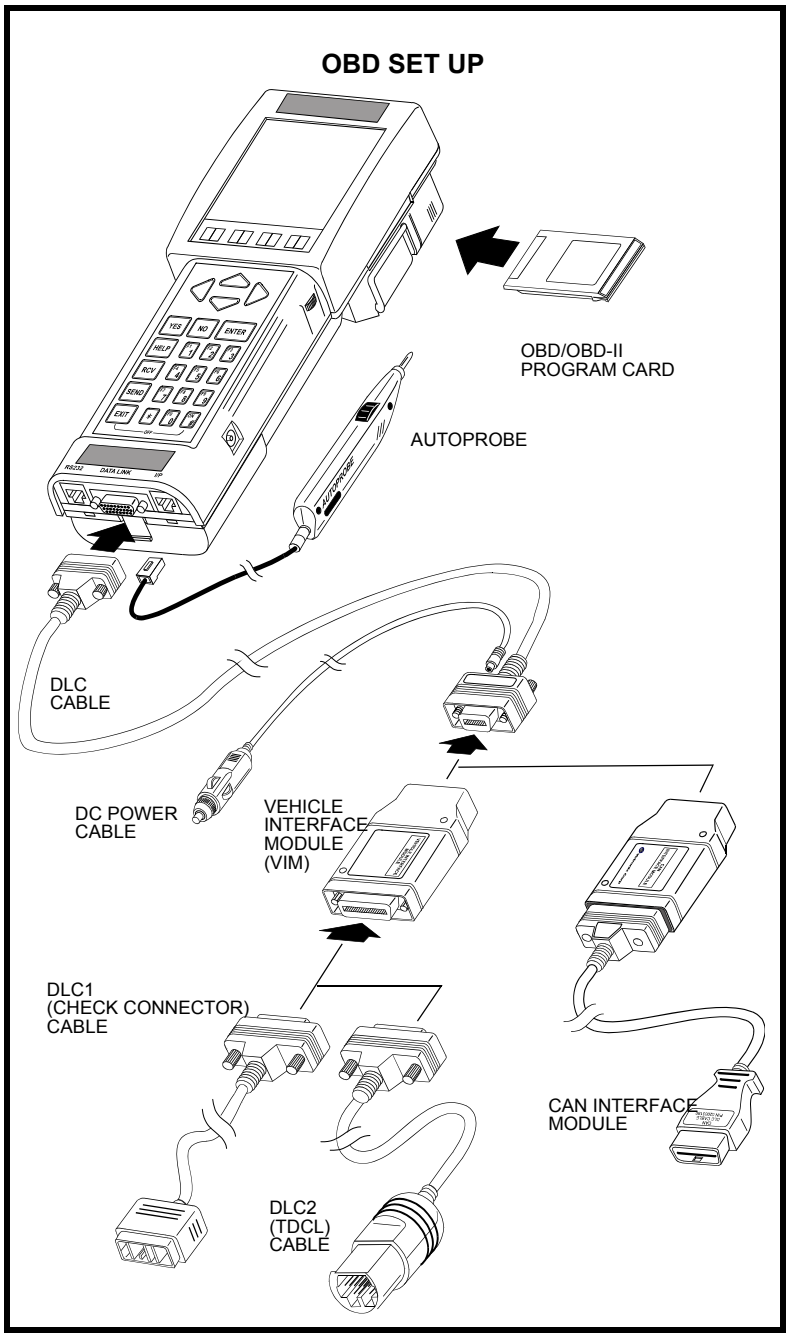
C. GLOSSARY AND ABBREVIATIONS

AB	Air Bag
ABS	Anti-lock Brake System
A/C	Air Conditioning
AS	Air Suspension
AT	Automatic Transmission
BAUD RATE	The speed at which data is transferred over a serial data link.
bps	Bits per second. Unit used for baud rate.
CAN	Controller Area Network
CCS	Cruise Control System
CURSOR	Highlighted text or data on the display screen. Same as Marker.
DATA LIST	A mode of operation. Basic diagnostic data parameters are displayed on the Tester.
DC	Direct Current
DCE	Data Communication Equipment. A term used to describe a device connected to an RS232 link.
DLC	Data Link Connector
DTE	Data Terminal Equipment. A term used to describe a device connected to an RS232 link.
DVM	Digital Volt Meter
ECU	Electronic Control Unit
EEPROM	Electronically Erasable PROM
FWD	Front Wheel Drive
Hz	Hertz. A unit of measure for frequency.
I/F	Interface
IG	Ignition
I/O	Input/Output
I/P	Instrumentation Port
LED	Light Emitting Diode
MARKER	Highlighted text or data on the display screen. Same as Cursor.
NICAD	Nickel cadmium rechargeable batteries.
NVH	Noise, Vibration, Harshness
OBD	On Board Diagnostics
OBD II	On-Board Diagnostics (Phase II). The California Air Resource Board (CARB) required that, by 1996, all vehicles sold in California (under 8500 GVWR) contain a certain minimum "on- board diagnostic" capability to diagnose emissions related failures of the engine control system. These diagnostic requirements have been designated as OBD II with a goal of monitoring "all of the emissions-related components on-board the vehicle for proper operation."
O2	Oxygen
RCV	Receive
RJ45	A modular phone connector.
RS232	Same as RS232C.
RS232C	The most standard serial communication interface used in the computer industry.

RWD	Rear Wheel Drive
SCREEN PRINT	An operating mode of the RS232 where the Tester display is sent to a printer.
SNAPSHOT	A mode of operation. In the SNAPSHOT mode, basic diagnostic data parameters are stored in the Tester during a road test and can be examined, printed or transferred to a computer at the end of the test.
TDCL	Total Diagnostic Communication Link
TDS	Theft Deterrent System
TRAC	Traction Control
VIN	Vehicle Identification Number

1.0 GETTING READY

Before using the OBD functions of the Program Card, the following steps must be performed:



1. Insert the Program Card into the Tester.
2. Connect the DLC cable to the Tester.
3. Connect the Autoprobe to the Tester, if using the oscilloscope or DVM functions.
4. Connect the 14-pin end of the Vehicle Interface Module (VIM) to the Tester DLC cable.
5. Depending on the model and the tests to be performed, connect either the DLC1 (Check Connector) cable or the DLC2 (TDCL) cable to the VIM, or the DLC3 (OBD-II Connector) cable to the DLC cable.

DLC1 (CHECK CONNECTOR) CABLE: Connect one end of the Check Connector cable to the VIM and the other end of the Check Connector cable to the underhood Check Connector.

DLC2 (TDCL) CABLE: Connect one end of the TDCL cable to the VIM, and the other end of the cable to the TDCL inside the vehicle.

CAN INTERFACE MODULE: The CAN Interface Module is used for ALL DLC3/J1962 Communication. Connect one end of the module to the DLC cable, and the other end of the cable to the DLC3 connector inside the vehicle.

6. Refer to the Tester Operator's Manual, to power the Tester.

HINT	For more accurate readings when using the Autoprobe, it is recommended that the Tester be powered directly from the battery with the Battery Adapter Cable.

2.0 FUNCTION AND VEHICLE SELECTION

When the Tester is powered up with the Program Card installed, you must confirm and/or enter information about the program card and about the vehicle being tested. The information includes the vehicle make, year, body type and engine type.

POWER-UP

The program card identification screen is displayed when the Tester is powered up. Press (ENTER) to continue.

ACTIVE KEY

(ENTER) Proceed to the <FUNCTION SELECT> Menu.

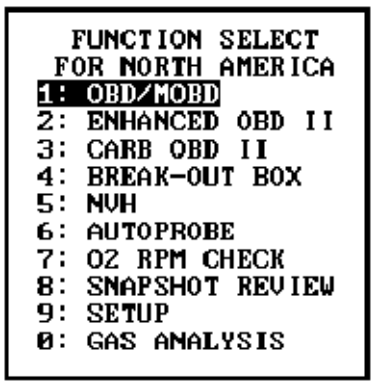
SELECTING AN APPLICATION

The menu selections are as follows.

<1: DIAGNOSIS>	For vehicle diagnostics, see next page.
<2: CUSTOMIZE>	To set customizable vehicle options, see the Customize Function Operator's Manual.
<3: ECU REPROGRAM>	For ECU Reprogramming, see Section *57.0 ECU Reprogramming on page 196*.

ACTIVE KEYS

△ ▽	Change highlighted menu item.
(1) - (3)	Select a menu item.
(ENTER)	Select the highlighted menu item.
(EXIT)	Return to the Power-up screen.



SELECTING A FUNCTION

All functions present in the Program Card are displayed. Refer to the following sections for operating instructions:

<1: OBD/MOBD>	See Section 3.0: OBD/M-OBD Menu through Section 53.0: Occupant Detect of this manual.
<2: ENHANCED OBD II>	See the Enhanced OBD II section of the OBD II Operator's Manual.
<3. CARB OBD II>	See CARB OBD II of the OBD II Operator's Manual.
<4: BREAK-OUT BOX>	See Break Out Box Operator's Manual.
<5: NVH>	See NVH Operator's Manual.
<6: AUTOPROBE>	See *Section 54.0 Autoprobe on page 185.*
<7: O2 RPM CHECK>	See *Section 55.0 O2S/RPM Check on page 193.*
<8: SNAPSHOT REVIEW>	See *Section 56.0 Snapshot Review on page 194.*
<9: SETUP>	See Using the Setup Mode Section in the Tester Operator's Manual.
<0: GAS ANALYSIS>	See Gas Analyzer Operator's Manual (USA only).

ACTIVE KEYS

△ ▽	Change highlighted menu item.
(1) - (0)	Select menu item.
(ENTER)	Select highlighted menu item.
(EXIT)	Return to the Application Select screen.

SELECTING THE VEHICLE

This screen is only displayed if a vehicle has previously been selected.

From the <VEHICLE SELECT> menu you can select a new vehicle to test or select the last vehicle that was tested. Use the up and down keys to select <NEW VEHICLE> or <LAST VEHICLE>, then press (ENTER).

NEW VEHICLE:	Select a new vehicle from the vehicle select displays.
LAST VEHICLE:	The selection criteria used to select the previous vehicle are displayed. Press (ENTER) to proceed to the OBD Menu.

ACTIVE KEYS

△ ▽	Move highlighted cursor between <NEW VEHICLE> or <LAST VEHICLE>.
(ENTER)	Select the highlighted menu item: either new vehicle or last vehicle.
(EXIT)	Return to <FUNCTION SELECT> menu.

MODEL YEAR SELECT SCREEN

The available model years are displayed. The "↓" indicates that there are more selections available than can be displayed on the screen. Use the up and down arrow keys to move the cursor between options, then press (ENTER) to select the model year.

ACTIVE KEYS

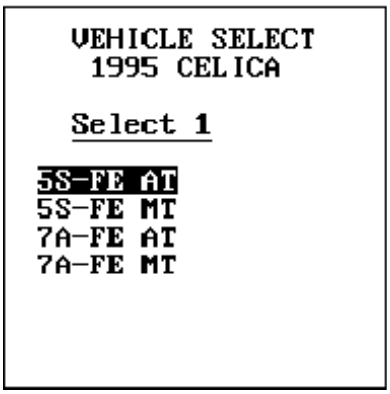
△ ▽	Move highlighted cursor between options.
(ENTER)	Select Model Year.
(EXIT)	Return to Vehicle Select screen.

MODEL SELECTION SCREEN

All body types available for the selected model year are displayed. Use the up and down keys to select the type of vehicle you are testing, then press (ENTER) to continue.

ACTIVE KEYS

△ ▽ Move highlighted cursor between menu options.
(ENTER) Select vehicle type.
(EXIT) Return to Model Year screen.

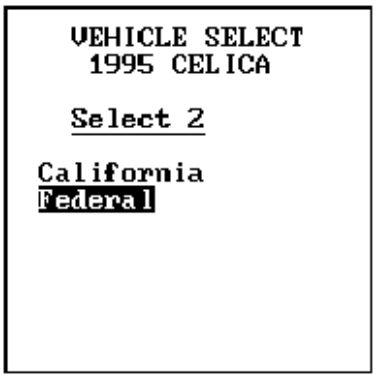


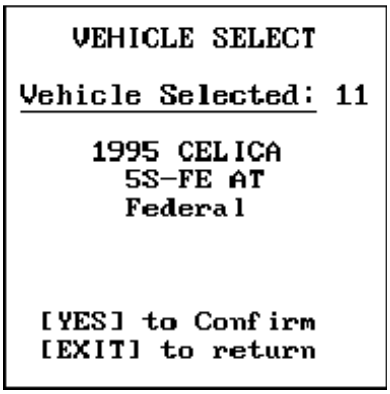
VEHICLE SELECT SCREEN(S)

In some cases further vehicle identification is required. Up to four select screens may be displayed to select a particular vehicle. Use the up and down arrow keys to move the cursor between options, then press (ENTER) to select the option.

ACTIVE KEYS

△ ▽ Move highlighted cursor between options.
(ENTER) Select highlighted menu option.
(EXIT) Return to previous screen.



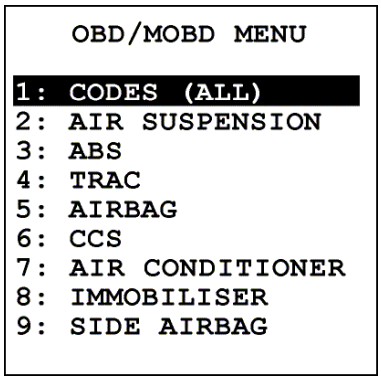


VEHICLE CONFIRMATION SCREEN

When all of the requested information has been entered, a summary screen of the vehicle configuration is displayed. If the information does not match the vehicle, press (EXIT) to review the previously displayed screens. Correct the information, then proceed through the vehicle selection process again. If the information matches the vehicle you are testing, press (YES) and the <OBD MENU> is displayed. The number in the right column is the unique vehicle reference number.

ACTIVE KEYS

(YES) Confirm systems selected.
(EXIT) Return to Vehicle Select displays.



3.0 OBD/M-OBD MENU

After the vehicle has been selected, the <OBD/MOBD MENU> is displayed. The <OBD/MOBD MENU> displays all of the systems on the selected vehicle that are available for diagnosis by the Tester. Press the number key corresponding to the desired selection OR use the ▽ △ keys to move the highlight to the desired selection and then press (ENTER). Remember that there may be more items than can be displayed on the screen at one time. Look for the ↑ or ↓ in the upper right corner of the display. The arrows indicate that more selections are available. Use the ▽ △ keys to display the additional selection items OR use the (✱)▽, (✱)△ to move the display a full page.

Test modes available for each of the vehicle systems are described in detail on the following pages.

Some systems provide many different test modes to aid in diagnosis. Other systems may only report DTC Info. The availability of test modes is dependent on the vehicle and system selected.

ACTIVE KEYS

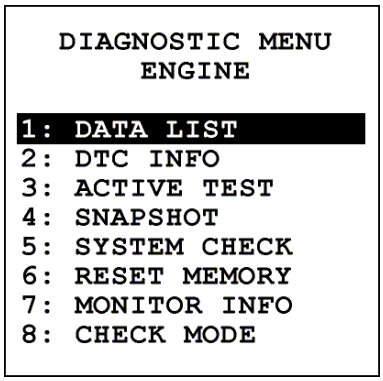
△ ▽	Change highlighted menu item.
(✱) △	Change to next page.
(✱) ▽	Change to previous page.
(1) - (9)	Select menu item.
(ENTER)	Select highlighted menu item.

4.0 M-OBD FUNCTIONS

For MY98 and later, the Tester is able to diagnose body, chassis, and other non-powertrain systems that use the Multiplex-OBD (M-OBD) communication protocol. M-OBD provides for fast data transfer rates, enhanced data parameters, enhanced Trouble Code descriptions, Freeze Frame data, and Input/Output Control (Active Test). Additional test modes and procedures are also defined for some M-OBD systems.

The operating procedures for the test modes common to all M-OBD systems are described in this section. The functions of Data List, DTC Info, Active Test, and Snapshot are similar for each of the M-OBD systems. Only the data list parameters displayed and active tests available are different. Please refer to this section for a description of the basic M-OBD system diagnostic functions.

4.1 DIAGNOSTIC MENU



The Diagnostic Menu is the top level menu for the M-OBD systems. All of the functions available for the selected ECU are accessible from the Diagnostic Menu. The current system selection is displayed on the second line of the Diagnostic Menu and all subsequent menus.

Additional tests and procedures specific to the selected ECU may also be available. Please refer to the section specific to the system under test.

<1: DATA LIST>	Display ECU data parameters in several convenient ways. See *Section DATA LIST MODE on page 72.*
<2: DTC INFO>	Display information and performs tests based on Trouble Code data. See *Section DTC INFO MENU on page 77.*
<3: ACTIVE TEST>	Perform interactive tests with the ECU. See *Section ACTIVE TEST on page 80.*
<4: SNAPSHOT>	Capture data parameters to isolate faults. See *Section SNAPSHOT on page 82.*
<5: SYSTEM CHECK>	Display O2S Sensor information and perform a Fuel Consumption test. See *Section SYSTEM CHECK on page 90.*
<6: RESET MEMORY>	Reset vehicle ECU memory. See *Section RESET MEMORY on page 92.*
<7: MONITOR INFO>	Review monitored sensors and results. See *Section MONITOR INFO on page 93.*
<8: CHECK MODE>	Initialize ECU to record first DTC events. See *Section CHECK MODE on page 94.*

ACTIVE KEYS

△ ▽	Change highlighted menu item.
(1) - (8)	Select menu item.
ENTER	Select highlighted menu item.

DATA LIST SELECTION

When <1: DATA LIST> is selected from the <DIAGNOSTIC>, you can select <ALL DATA>, <USER DATA>, one of the preset groups of <CUSTOM DATA>, or the <EXTENDED DATA> option. Only the <CUSTOM DATA> supported by the vehicle being tested is displayed.

ACTIVE KEYS

△▽ Change highlighted item.
(ENTER) Select highlighted item.

ALL DATA

Choose <ALL DATA> from the <SELECT DATA> menu to proceed directly to the <DATA LIST> mode and display data items for general vehicle maintenance. Other data items are displayed in <USER DATA>.

USER DATA

Choose <USER DATA> from the <SELECT DATA> menu to select a subset of data items to display. All of the supported data items are displayed. Use (YES) to select the parameters you want to view. (NO) can be used to deselect a data item. Press (ENTER) to go to the <DATA LIST> mode. The <User Data> selection is saved in Tester memory.

ACTIVE KEYS

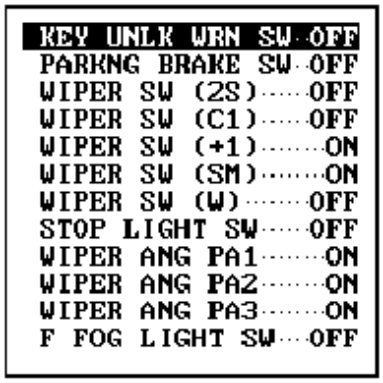
△ ▽ Change highlighted item.
(YES) Select highlighted item.
(NO) Deselect highlighted item.
(ENTER) Go to <DATA LIST> mode.
(✱)(YES) Select all data items.
(✱)(NO) Deselect all data items.

CUSTOM DATA

Additional items on the <SELECT DATA> menu refer to custom subsets of data items that pinpoint diagnosis to a particular system. Custom data lists are based on the vehicle system's supported parameters and may vary between vehicle systems. Selecting a custom data list proceeds directly to the <DATA LIST> mode and displays the appropriate parameters.

EXTENDED DATA

The <EXTENDED DATA> option displays all possible data items for the selected vehicle system, including items which are not normally required for diagnosis. With this option, the update rate of the data list display may be slower than normal due to the large number of data items collected from the vehicle.


KEY UNLK WRN SW OFF
PARKNG BRAKE SW OFF
WIPER SW (2S) OFF
WIPER SW (C1) OFF
WIPER SW (+1) ON
WIPER SW (SM) ON
WIPER SW (W) OFF
STOP LIGHT SW OFF
WIPER ANG PA1 ON
WIPER ANG PA2 ON
WIPER ANG PA3 ON
F FOG LIGHT SW OFF

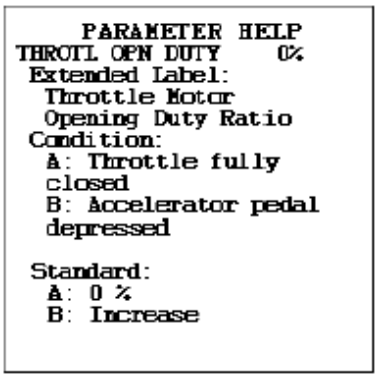
DATA LIST MODE

The <DATA LIST> mode displays data reported by the vehicle system in a list type format.

Press (F1) to select the <DATA LIST> mode from any Data List display. This is the default display mode. Twelve parameters using large characters or 16 parameters using compressed characters can be displayed at one time. All parameters can be viewed by pressing the up or down keys.

ACTIVE KEYS

△ ▽	Move the display one parameter.
(✱) △	Move the display one page.
(✱) ▽	
(F2)	Go to <LED/LIST> mode.
(F3)	Go to <BAR GRAPH> mode.
(F4)	Go to <LINE GRAPH> mode.
(F5)	Go to <CUSTOM LIST> mode.
(F6)	Setup <STRIP CHART> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(#) (F8)	Start Strip Chart.
(#) (F9)	Stop Strip Chart.
(✱) (HELP)	Display parameter information.
(SEND)	Print data list.

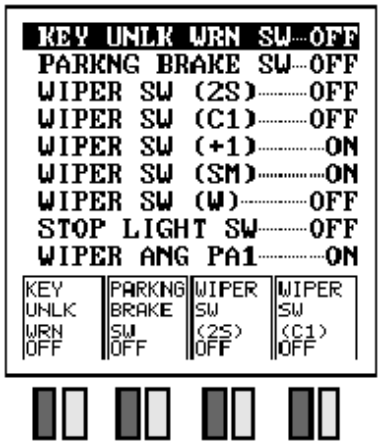


PARAMETER INFORMATION

Press (✱) (HELP) from any Data List mode to display information about the highlighted parameter. The information displayed includes parameter name, current value, normal operating conditions, and expected values.

ACTIVE KEYS

△ ▽	Display next screen.
(EXIT)	Return to Data List display.


KEY UNLK WRN SW OFF
PARKNG BRAKE SW OFF
WIPER SW (2S) OFF
WIPER SW (C1) OFF
WIPER SW (+1) ON
WIPER SW (SM) ON
WIPER SW (W) OFF
STOP LIGHT SW OFF
WIPER ANG PA1 ON
KEY UNLK WRN OFF
PARKNG BRAKE SW OFF
WIPER SW (2S) OFF
WIPER SW (C1) OFF

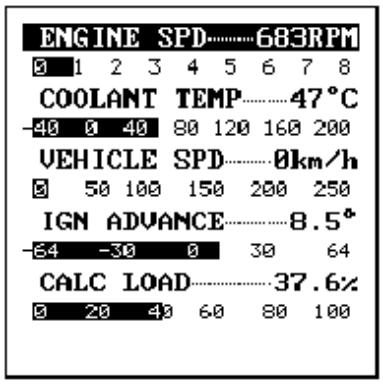
LED/LIST MODE

Press (F2) to select the <LED/LIST> mode from any Data List display. The <LED/LIST> gives you a quick view of the status of four discrete parameters displayed in boxes at the bottom of the Data List display. The <LED/LIST> also allows you to change the order of the displayed parameters.

The status of the selected parameters is displayed at the bottom of the box and is also indicated by the red and green lights beneath each box. The parameters listed can be selected with the Active Keys.

ACTIVE KEYS

△ ▽	Move the cursor (highlight) up and down.
(YES)	Change the highlighted parameter to the next parameter in the list.
(NO)	Change the highlighted parameter to the previous parameter in the list.
(✱)(YES)	Change to the next parameter not currently displayed.
(✱)(NO)	Change to the previous parameter not currently displayed.
(F1)	Go to <DATA LIST> mode.
(F3)	Go to <BAR GRAPH> mode.
(F4)	Go to <LINE GRAPH> mode.
(F5)	Go to <CUSTOM LIST> mode.
(F6)	Setup <STRIP CHART> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(#)(F8)	Start Strip Chart.
(#)(F9)	Stop Strip Chart.
(✱)(HELP)	Display parameter information.
(SEND)	Print data list.



BAR GRAPH MODE

Press (F3) to select the <BAR GRAPH> mode from any Data List display. The <BAR GRAPH> shows relationships of five or six different data parameters The displayed data parameters can be selected with the Active Keys.

ACTIVE KEYS

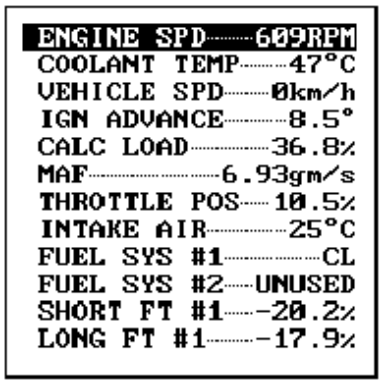
▽△	Move the cursor (highlight) up and down.
(YES)	Change the highlighted parameter to the next parameter in the list.
(NO)	Change the highlighted parameter to the previous parameter in the list.
(✱)(YES)	Change to the next parameter not currently displayed.
(✱)(NO)	Change to the previous parameter not currently displayed.
(F1)	Go to <DATA LIST> mode.
(F2)	Go to <LED/LIST> mode.
(F4)	Go to <LINE GRAPH> mode.
(F5)	Go to <CUSTOM LIST> mode.
(F6)	Setup <STRIP CHART> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(#)(F8)	Start Strip Chart.
(#)(F9)	Stop Strip Chart.
(✱)(HELP)	Display parameter information.
(SEND)	Print data list.

LINE GRAPH MODE

Press (F4) to select the <LINE GRAPH> mode from any Data List display. The <LINE GRAPH> displays two data parameters on the moving line graph. The displayed data parameters can be selected with the Active Keys.

ACTIVE KEYS

◁ ▷	Change Line Graph time scale. Allowable scales are 5, 10, 15, 30, 60, 100, 200, and 300 seconds.
△ ▽	Move the cursor (highlight) up and down.
(YES)	Change the highlighted parameter to the next parameter in the list.
(NO)	Change the highlighted parameter to the previous parameter in the list.
(F1)	Go to <DATA LIST> mode.
(F2)	Go to <LED/LIST> mode.
(F3)	Go to <BAR GRAPH> mode.
(F5)	Go to <CUSTOM LIST> mode.
(F6)	Setup <STRIP CHART> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(#)(F8)	Start Strip Chart.
(#)(F9)	Stop Strip Chart.
(✱)(HELP)	Display parameter information.
(ENTER)	Freeze display.
(SEND)	Print data list.

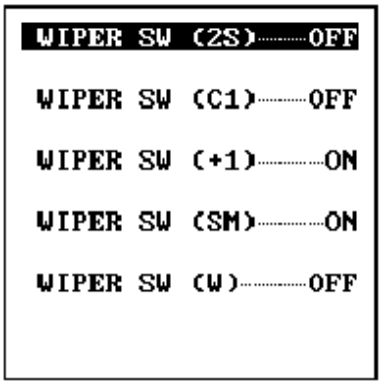


CUSTOM LIST MODE

Press (F5) to select <CUSTOM LIST> from any Data List display. The <CUSTOM LIST> allows you to change the order of the displayed data items.

ACTIVE KEYS

↑ ↓	Move the cursor (highlight) up and down.
(YES)	Change the highlighted parameter to the next parameter in the list.
(NO)	Change the highlighted parameter to the previous parameter in the list.
(✱)(YES)	Change to the next parameter not currently displayed.
(✱)(NO)	Change to the previous parameter not currently displayed.
(F1)	Go to <DATA LIST> mode.
(F2)	Go to <LED/LIST> mode.
(F3)	Go to <BAR GRAPH> mode.
(F4)	Go to <LINE GRAPH> mode.
(F6)	Setup <STRIP CHART> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(#)(F8)	Start Strip Chart.
(#)(F9)	Stop Strip Chart.
(✱)(HELP)	Display parameter information.
(SEND)	Print data list.



STRIP CHART MODE

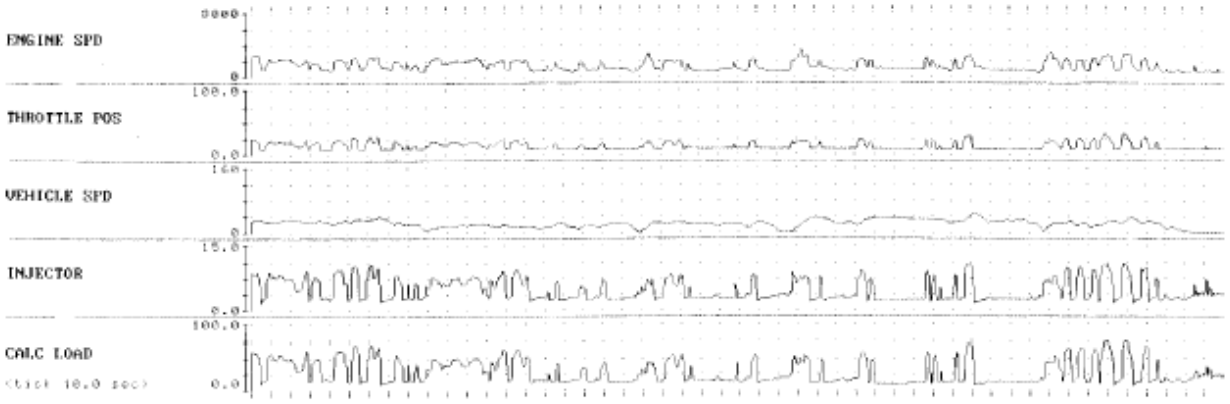
NOTE	This function requires the optional VP-411/414 printer.

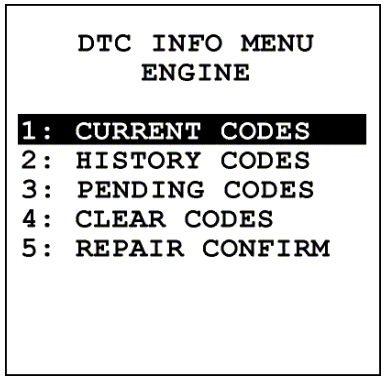
Press (F6) to select the <STRIP CHART> setup from any Data List display. The <STRIP CHART> allows you to select five parameters to be printed. The Strip Chart mode only works with the optional VP-411/414 printer. Press (#)(F8) to start the Strip Chart printing. Live data is printed until it is turned off with (#)(F9) or when you exit Data List.

ACTIVE KEYS

▽△	Move the cursor (highlight) up and down.
(YES)	Change the highlighted parameter to the next parameter in the list.
(NO)	Change the highlighted parameter to the previous parameter in the list.
(✱)(YES)	Change to the next parameter not currently displayed.
(✱)(NO)	Change to the previous parameter not currently displayed.
(F1)	Go to <DATA LIST> mode.
(F2)	Go to <LED/LIST> mode.
(F3)	Go to <BAR GRAPH> mode.
(F4)	Go to <LINE GRAPH> mode.
(F5)	Go to <CUSTOM LIST> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(#)(F8)	Start Strip Chart.
(#)(F9)	Stop Strip Chart.
(✱)(HELP)	Display parameter information.
(SEND)	Print data list.

SAMPLE OF STRIP CHART PRINTOUT





DTC INFO MENU

Press (2) to select <DTC INFO> from the <DIAGNOSTIC> menu. The <DTC INFO> menu is displayed.

<1: CURRENT CODES>	Display codes currently stored in the ECU.
<2: HISTORY CODES>	Display history codes.
<3: PENDING CODES>	Display codes.
<4: CLEAR CODES>	Clear codes are currently stored in the ECU.
<5: REPAIR CONFIRM>	Clear DTCs that were repaired by the technician.

ACTIVE KEYS

△ ▽	Change highlighted menu item.
(1) - (5)	Select menu item.
(ENTER)	Select highlighted menu item.

DIAG. TROUBLE CODES
ECU: TILT&TELESCO
Number of DTCs: 2
*B2602 Key Unlock Warning Switch Malfunction
*B2613 Telescopic Position Sensor Circuit Open or Short
ENTER = FREEZE FRAME
[EXIT] to Continue

CURRENT CODES

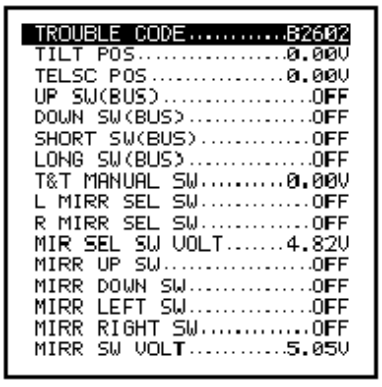
Press (1) to select <CURRENT CODES> from the <DTC INFO> menu. Codes currently stored in the ECU are displayed. The number of stored codes is displayed in the upper right corner.

A "↓" in the upper right of the display indicates that there are more DTCs than can be displayed at one time. Use the △ and ▽ keys to scroll through the list of received Trouble Codes.

A "*" next to the Trouble Code ID indicates there is freeze frame data associated with that DTC. If freeze frame data is available for the high-lighted DTC, press (ENTER) to display the <FREEZE DATA>.

ACTIVE KEYS

△ ▽	Move the highlight up or down. Scroll through all Trouble Codes.
(ENTER)	Display Freeze Data.



FREEZE DATA

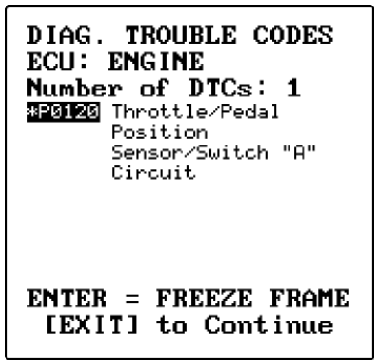
Freeze Data is only available for certain DTCs. The ECU stores up to two frames of data. The Freeze Data is the state of the sensor and ECU outputs when the DTC was recorded.

The Tester displays all of the parameters saved with the DTC. The Freeze Data does not change (it is static) and does not represent the current ECU state.

The Freeze Data is displayed in a data list format. Only the <DATA LIST> mode is available for Freeze Data.

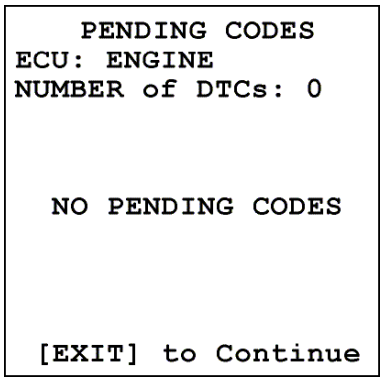
ACTIVE KEYS

△ ▽	Move the cursor (highlight) up or down.
(✱)(HELP)	Display parameter information.
(EXIT)	Return to Trouble Code review.



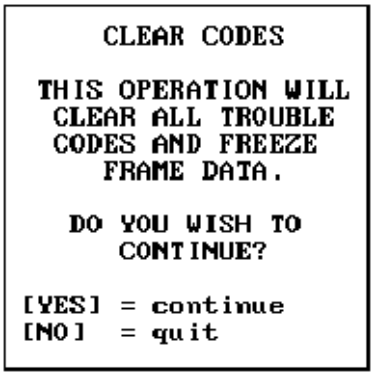
HISTORY CODES

Press (2) to select <HISTORY CODES> from the <DTC INFO> menu. The Tester displays the History Codes screen.



PENDING CODES

Press (3) to select <PENDING CODES> from the <DTC INFO> menu. Pending Codes currently stored in the ECU are displayed.


CLEAR CODES
THIS OPERATION WILL CLEAR ALL TROUBLE CODES AND FREEZE FRAME DATA.
DO YOU WISH TO CONTINUE?
[YES] = continue
[NO] = quit

CLEAR CODES

Press (4) to select <CLEAR CODES> from the <DTC INFO> menu. The Tester displays the Clear Codes screen. Press (NO) if you do not want to clear the Trouble Codes or press (YES) to clear the codes.

ACTIVE KEYS

(YES) Clear Trouble Codes and Freeze Data.
(NO) Return to <DTC INFO> menu without clearing Trouble Codes and Freeze Data.

CLEAR CODES SCREEN #2

The Tester indicates that the Trouble Codes and Freeze Data have been cleared. Press (ENTER) to return to the <DTC INFO> Menu.

ACTIVE KEYS

(ENTER) Return to <DTC INFO> menu.

REPAIR CONFIRM

The <REPAIR CONFIRMATION> function is used to verify a problem that sets a code or to confirm complete repairs.

Press (5) to select <REPAIR CONFIRMATION> from the <DTC INFO> menu. Some Trouble Codes are detected during a particular driving pattern. Repairs made to correct these codes can be confirmed using this test.

Select a Trouble Code to verify or for which a repair has been made.

ACTIVE KEYS

△ ▽ Move highlight up or down.
(ENTER) Select Trouble Code; continue with Repair Confirmation.

CLEAR CODES

Press (YES) to clear the codes. Codes must be cleared in order to confirm the repair.

ACTIVE KEYS

(YES) Clear Trouble Code.
(NO) Do not clear codes.

ACTIVE TEST

The Active Test Function allows you to verify proper operation of external input and output components and circuitry by isolation techniques. Real world sensor inputs can be temporarily bypassed, and direct control of output devices can be achieved. Since substitution may cause the control module to operate in a manner which is unsuitable or unsafe for "on-the-road" operation, precautions must be taken to ensure safe operation. The substituted value is used only for the duration of the diagnostic procedure, and when the module is returned to normal operation, or control of the data value is returned to the vehicle, then the substituted value reverts back to the normal value determined by the control system.[1]

Press (3) to select <ACTIVE TEST> from the <DIAGNOSTIC> menu. This display allows you to choose from a list of active tests to execute. Only active tests supported by the current vehicle are displayed.

ACTIVE KEYS

△ ▽ Change highlighted item.
(ENTER) Select highlighted item.

ALL DATA (Non-CAN Vehicles)

Choose <ALL DATA> from the <SELECT DATA> menu to proceed directly to the <ACTIVE TEST> mode and display all of the data items reported by the vehicle's controllers.

PRIMARY DATA (CAN Vehicles)

Choose <PRIMARY> from the <SELECT DATA> menu to proceed directly to the <ACTIVE TEST> mode and display all of the data items reported by the vehicle's controllers.

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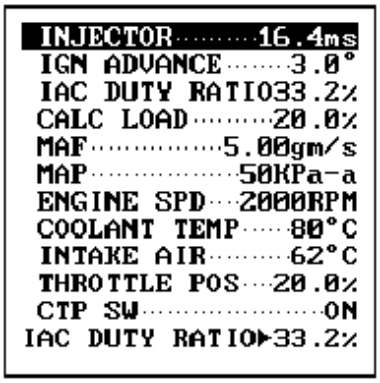
USER DATA

Choose <USER DATA> from the <SELECT DATA> menu to select a subset of data items to display. All of the supported data items are displayed. Use (YES) to select the parameters you want to view. (NO) can be used to deselect a data item. The <USER DATA> selection is saved in Tester memory.

ACTIVE KEYS

△▽	Change highlighted item.
(YES)	Select highlighted item.
(NO)	Deselect highlighted item.
(ENTER)	Go to <ACTIVE TEST>.
(✱)(YES)	Select all data items.
(✱)(NO)	Deselect all data items.



ACTIVE TEST DATA LIST

The parameters associated with the active test are displayed in a Data List format. All of the <DATA LIST> modes are available. Use the ◁ and ▷ keys to change the active parameter displayed on the bottom line. In <LINE GRAPH> mode, the time scale is fixed at 30 seconds.

ACTIVE KEYS

◁ ▷	Change Active parameter value.
△ ▽	Move the display up or down one parameter.
(✱)△	Move the display one page. (<DATA LIST> mode only.)
(✱)▽	
(YES)	Change the highlighted parameter to the next parameter in the list. (<LED/LIST>, <BAR GRAPH>, <LINE GRAPH>, and <CUSTOM LIST> modes only.)
(NO)	Change the highlighted parameter to the previous parameter in the list. (<LED/LIST>, <BAR GRAPH>, <LINE GRAPH>, and <CUSTOM LIST> modes only.)
(F1)	Go to <DATA LIST> mode.
(F2)	Go to <LED/LIST> mode.
(F3)	Go to <BAR GRAPH> mode.
(F4)	Go to <LINE GRAPH> mode.
(F5)	Go to <CUSTOM LIST> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(✱)(HELP)	Display parameter information.
(SEND)	Print data list.
(EXIT)	Return to <TEST DATA> menu.

SNAPSHOT

Press ④ to select <SNAPSHOT> from the <DIAGNOSTIC > menu. The <SNAPSHOT> menu is displayed.

<1: MANUAL SNAPSHOT>	Capture a snapshot of data.
<2: CODES SNAPSHOT>	Capture a snapshot of data after a Trouble Code is received.
<3: REPLAY SNAPSHOT>	Replay snapshot.
<4: TRIGGER POINT>	Choose how much data to save after the trigger.
<5: USER DATA>	Select a subset of data items to display.

MANUAL SNAPSHOT

Press (1) to select <MANUAL SNAPSHOT> from the <SNAPSHOT> menu. The <MANUAL SNAPSHOT> function captures a snapshot of data. Select <ALL>, <USER DATA>, or <CUSTOM DATA> list for the snapshot capture.

DATA CAPTURE PHASE

The <LINE GRAPH> mode appears. Use the left and right keys to select the desired time scale for the snapshot. <Wait: Manual Trigger> is displayed on the screen until the snapshot is triggered. When a trigger occurs, <Trigger> is displayed while data is being saved.

ACTIVE KEYS

◁ ▷	Select snapshot capture time scale. Allowable time scales are 5, 10, 15, 30, 60, 100, 200, and 300 seconds.
△ ▽	Move the display up or down one parameter.
✱ △	Move the display one page. (<DATA LIST> mode only.)
✱ ▽	
YES	Change the highlighted parameter to the next parameter in the list. (<LED/LIST>, <BAR GRAPH>, <LINE GRAPH>, and <CUSTOM LIST> modes only.)
NO	Change the highlighted parameter to the previous parameter in the list. (<LED/LIST>, <BAR GRAPH>, <LINE GRAPH>, and <CUSTOM LIST> modes only.)
✱ YES	Change to the next parameter not currently displayed. (<LED/LIST>, <BAR GRAPH>, <CUSTOM LIST>, and <LINE GRAPH> modes only.)
✱ NO	Change to the previous parameter not currently displayed. (<LED/LIST>, <BAR GRAPH>, <CUSTOM LIST>, and <LINE GRAPH> modes only.)
ENTER	Trigger the Snapshot and terminates data capture.
F1	Go to <DATA LIST> mode.
F2	Go to <LED/LIST> mode.
F3	Go to <BAR GRAPH> mode.
F4	Go to <LINE GRAPH> mode.
F5	Go to <CUSTOM LIST> mode.
F9	Change between large and compressed character size.
F0	Turn cursor on and off.
✱ HELP	Display parameter information.
SEND	Print data list.

SNAPSHOT SAVE

After completion of the data capture, the snapshot can be saved for later review.

Press (YES) to save this data set or (NO) to continue without saving the data. The current snapshot can be reviewed immediately even if not saved.

HINT	The snapshot data is stored on the Program Card. Make sure that the same Program Card is used when reviewing stored snapshot data.

ACTIVE KEYS

(YES)	Save snapshot data.
(NO)	Go to Data Display phase without saving snapshot.

DATA DISPLAY PHASE

At the completion of the data capture phase, <Sample> and a time stamp are displayed at the bottom of the screen. The trigger point is indicated by "Sample 0.0 sec". All data samples have a time stamp relative to the trigger. For a 50% trigger and 30-second data capture, the Tester displays samples from -15.0 seconds to 15.0 seconds.

Data captured in the Snapshot mode can be displayed in all of the formats that are available in the <DATA LIST> mode, except for Strip Chart.

ACTIVE KEYS

◁ ▷	Sequence through the sample displayed.
△ ▽	Move the display up or down one parameter.
(✱)△	Move the display one page. (<DATA LIST> mode only.)
(✱)▽	
(YES)	Change the highlighted parameter to the next parameter in the list. (<LED/LIST>, <BAR GRAPH>, <LINE GRAPH>, and <CUSTOM LIST> modes only.)
(NO)	Change the highlighted parameter to the previous parameter in the list. (<LED/LIST>, <BAR GRAPH>, <LINE GRAPH>, and <CUSTOM LIST> modes only.)
(✱)(YES)	Change to the next parameter not currently displayed. (<LED/LIST>, <BAR GRAPH>, <CUSTOM LIST>, and <LINE GRAPH> modes only.)
(✱)(NO)	Change to the previous parameter not currently displayed. <LED/LIST>, <BAR GRAPH>, <CUSTOM LIST>, and <LINE GRAPH> modes only.)
(F1)	Go to <DATA LIST> mode.
(F2)	Go to <LED/LIST> mode.
(F3)	Go to <BAR GRAPH> mode.
(F4)	Go to <LINE GRAPH> mode.
(F5)	Go to <CUSTOM LIST> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(✱)(ENTER)	Change ECU.
(✱)(HELP)	Display parameter information.
(SEND)	Print data list.

CODES SNAPSHOT

Press (2) to select <CODES SNAPSHOT> from the <SNAPSHOT> menu. The <CODES SNAPSHOT> function captures a snapshot of data after a Trouble Code is received. Select <ALL DATA>, <USER LIST>, or <CUSTOM DATA> list for the snapshot capture. The operation of <CODES SNAPSHOT> is identical to <MANUAL SNAPSHOT> except the trigger occurs when any Trouble Code is set.

DATA CAPTURE PHASE

The <LINE GRAPH> mode appears. Use the left and right keys to select the desired time scale for the snapshot. <Wait: Select Trigger> is displayed until the snapshot is triggered. When a trigger occurs, <Trigger> is displayed while data is being saved.

ACTIVE KEYS

◁ ▷ Select snapshot capture time scale. Allowable time scales are 5, 10, 15, 30, 60, 100, 200, and 300 seconds.

△ ▽ Move the display up or down one parameter.

(✱)△ Move the display one page. (<DATA LIST> mode only.)

(✱)▽

YES Change the highlighted parameter to the next parameter in the list. (<LED/LIST>, <BAR GRAPH>, <LINE GRAPH>, and <CUSTOM LIST> modes only.)

NO Change the highlighted parameter to the previous parameter in the list. (<LED/LIST>, <BAR GRAPH>, <LINE GRAPH>, and <CUSTOM LIST> modes only.)

(✱)YES Change to the next parameter not currently displayed. (<LED/LIST>, <BAR GRAPH>, <CUSTOM LIST>, and <LINE GRAPH> modes only.)

(✱)NO Change to the previous parameter not currently displayed. (<LED/LIST>, <BAR GRAPH>, <CUSTOM LIST>, and <LINE GRAPH> modes only.)

ENTER Trigger the Snapshot and terminates data capture.

F1 Go to <DATA LIST> mode.

F2 Go to <LED/LIST> mode.

F3 Go to <BAR GRAPH> mode.

F4 Go to <LINE GRAPH> mode.

F5 Go to <CUSTOM LIST> mode.

F9 Change between large and compressed character size.

F0 Turn cursor on and off.

(✱)HELP Display parameter information.

SEND Print data list.

SNAPSHOT SAVE

After completion of the data capture, the snapshot can be saved for later review.

Press (YES) to save this data set or (NO) to continue without saving the data. The current snapshot can be reviewed immediately even if not saved.

ACTIVE KEYS

(YES) Save snapshot data.
(NO) Continue to Data Display phase without saving snapshot data.

DATA DISPLAY PHASE

At the completion of the data capture phase, <Sample> and a time stamp are displayed at the bottom of the screen. The trigger point is indicated by "Sample 0.0 sec". All data samples have a time stamp relative to the trigger. For a 50% trigger and 30-second data capture, the Tester displays samples from -15.0 seconds to 15.0 seconds.

Data captured in the <SNAPSHOT> mode can be displayed in all of the formats that are available in the <DATA LIST> mode, except for Strip Chart.

ACTIVE KEYS

◁ ▷ Sequence through the sample displayed.
△ ▽ Move the display up or down one parameter.
(✱)△ Move the display one page. (<DATA LIST> mode only.)
(✱)▽
(YES) Change the highlighted parameter to the next parameter in the list. (<LED/LIST>, <BAR GRAPH>, <LINE GRAPH>, and <CUSTOM LIST> modes only.)
(NO) Change the highlighted parameter to the previous parameter in the list. (<LED/LIST>, <BAR GRAPH>, <LINE GRAPH>, and <CUSTOM LIST> modes only.)
(✱)(YES) Change to the next parameter not currently displayed. (<LED/LIST>, <BAR GRAPH>, <CUSTOM LIST>, and <LINE GRAPH> modes only.)
(✱)(NO) Change to the previous parameter not currently displayed. <LED/LIST>, <BAR GRAPH>, <CUSTOM LIST>, and <LINE GRAPH> modes only.)
(F1) Go to <DATA LIST> mode.
(F2) Go to <LED/LIST> mode.
(F3) Go to <BAR GRAPH> mode.
(F4) Go to <LINE GRAPH> mode.
(F5) Go to <CUSTOM LIST> mode.
(F9) Change between large and compressed character size.
(F0) Turn cursor on and off.
(✱)(ENTER) Change ECU.
(✱)(HELP) Display parameter information.
(SEND) Print data list.

REPLAY SNAPSHOT

Press (3) to select <REPLAY SNAPSHOT> from the <SNAPSHOT> menu.

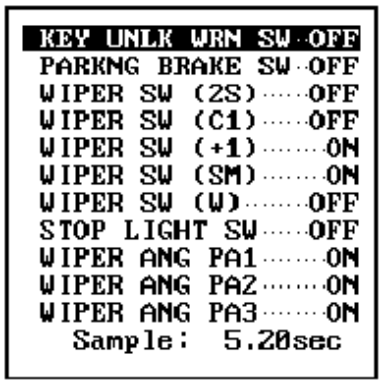
ACTIVE KEYS

▲ ▼	Move the cursor (highlight) up and down.
(ENTER)	Display the vehicle information of the selected snapshot data.
(✱)(ENTER)	Delete selected snapshot from the list.

The vehicle and system information of the selected snapshot data is displayed.

ACTIVE KEY

(ENTER)	Display selected snapshot data.



The data parameters which were captured during the event are displayed. The Data Display phase is indicated by <Sample> and a time stamp.

ACTIVE KEYS

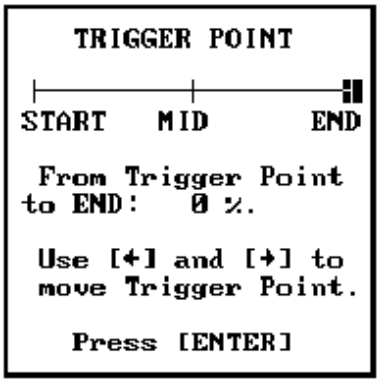
◁ ▷	Sequence through the sample displayed.
▲ ▼	Move the display up or down one parameter.
(✱)▲	Move the display one page. (<DATA LIST> mode only.)
(✱)▼	
(YES)	Change the highlighted parameter to the next parameter in the list. (<LED/LIST>, <BAR GRAPH>, <LINE GRAPH>, and <CUSTOM LIST> modes only.)
(NO)	Change the highlighted parameter to the previous parameter in the list. (<LED/LIST>, <BAR GRAPH>, <LINE GRAPH>, and <CUSTOM LIST> modes only.)
(✱)(YES)	Change to the next parameter not currently displayed. (<LED/LIST>, <BAR GRAPH>, <CUSTOM LIST>, and <LINE GRAPH> modes only.)
(✱)(NO)	Change to the previous parameter not currently displayed. (<LED/LIST>, <BAR GRAPH>, <CUSTOM LIST>, and <LINE GRAPH> modes only.)
(F1)	Go to <DATA LIST> mode.
(F2)	Go to <LED/LIST> mode.
(F3)	Go to <BAR GRAPH> mode.
(F4)	Go to <LINE GRAPH> mode.
(F5)	Go to <CUSTOM LIST> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(✱)(HELP)	Display parameter information.
(SEND)	Print data list.

TRIGGER POINT

Press (4) to select <TRIGGER POINT> from the <SNAPSHOT> menu. <TRIGGER POINT> allows you to choose how much data to save after the trigger.

The display at the left stores 50% of the data before and 50% of the data after the trigger point.

The display at the left stores 100% of the data after the trigger point.



The display at the left stores no data after the trigger point.

ACTIVE KEYS

◁ ▷ Move the trigger point marker left or right.
(ENTER) Confirm trigger point setting and return to the <CURRENT DATA> menu.

USER DATA

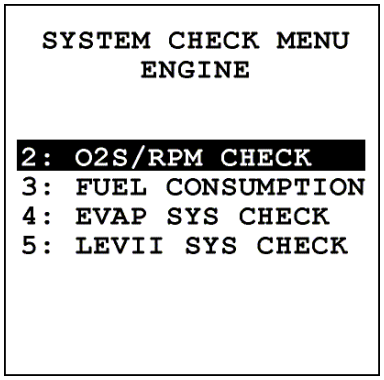
Press (5) to select <USER SELECT> from the <SNAPSHOT> menu. <USER SELECT> allows you to select a subset of data items to display. All of the supported data items are displayed. Use (YES) to select the parameters you want to view. (NO) can be used to deselect a data item. The <USER SELECT> list is saved in Tester memory.

ACTIVE KEYS

△ ▽	Change highlighted item.
(YES)	Select highlighted item.
(NO)	Deselect highlighted item.
(✱)(YES)	Select all data items.
(✱)(NO)	Deselect all data items.
(ENTER)	Go to <DATA LIST> mode.

WIRELESS REGISTRATION

Please reference the Service Manual for these functions.



SYSTEM CHECK

Press (6) to select <SYSTEM CHECK> from the <DIAGNOSTIC> menu. The System Check provides access to the O2S/RPM and FUEL CONSUMPTION menus.

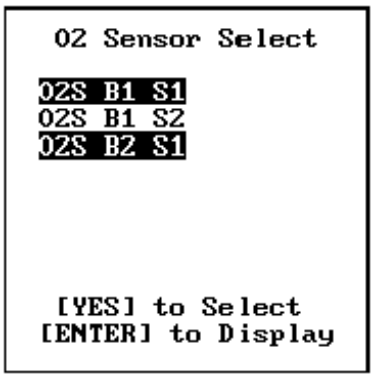
<2: O2S/RPM CHECK>	View Oxygen Sensor voltages.
<3: FUEL CONSUMPTION>	Calculate actual fuel used by vehicle.
<4: EVAP SYS CHECK>	Please reference the Service Manual for this function.
<5: LEVII SYS CHECK>	Please reference the Service Manual for this function.

ACTIVE KEYS

△ ▽	Change highlighted item.
(2) - (5)	Select menu item.
(ENTER)	Select highlighted menu item.

O2S/RPM CHECK

Press (2) to select <O2S/RPM CHECK> from the <SYSTEM CHECK MENU>. The O2S/RPM CHECK provides a way to view the oxygen sensor voltages on a line graph and to monitor the engine RPM.

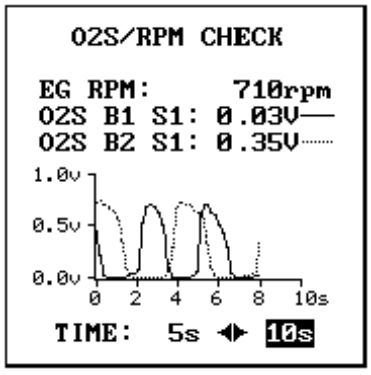


SENSOR SELECTION

The O2 sensors available for this vehicle are displayed. Select up to two sensors and press (ENTER) to continue.

ACTIVE KEYS

△ ▽	Move highlight.
(YES)	Select sensor.
(NO)	Deselect sensor.
(ENTER)	Display data.

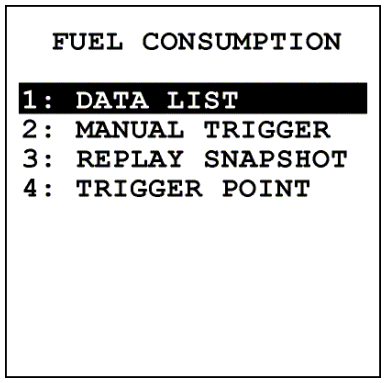


DATA DISPLAY

The selected O2 sensor voltages and engine RPM are displayed.

ACTIVE KEYS

◁ ▷	Toggle the time scale between 5 seconds and 10 seconds.
(ENTER)	Toggle the display between Hold mode and Real Time mode.
(EXIT)	Return to the <TEST DATA> menu.



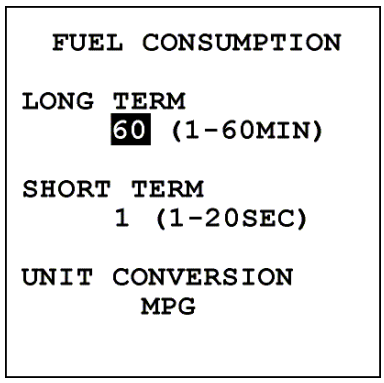
FUEL CONSUMPTION

Press (3) to select <FUEL CONSUMPTION> from the <SYSTEM CHECK MENU>. The fuel consumption function calculates the actual fuel used by the vehicle.

<1: DATA LIST>	Display fuel consumption parameters.
<2: MANUAL SNAPSHOT>	Capture fuel consumption parameters.
<3: REPLAY SNAPSHOT>	Replay fuel consumption snapshots.
<4: TRIGGER POINT>	Set snapshot trigger point.

ACTIVE KEYS

△ ▽	Change highlighted menu item.
ENTER	Select the highlighted menu entry.
(1) - (4)	Select menu item.



FUEL CONSUMPTION SETUP

This screen appears after selecting <DATA LIST> or <MANUAL SNAPSHOT> from the <FUEL CONSUMPTION> menu. You can select the time frames that fuel consumption averaging will be performed over for both the long and short term averages. Also, the units to be displayed are selected using this screen.

HINT

The following units are available for the fuel consumption functions:

km/l	= Distance per litre
l/100 km	= Litre per 100 km
MPG	= Distance per Gallon (3.8l)
MPIG	= Distance per Imperial Gallon (4.5l)

ACTIVE KEYS

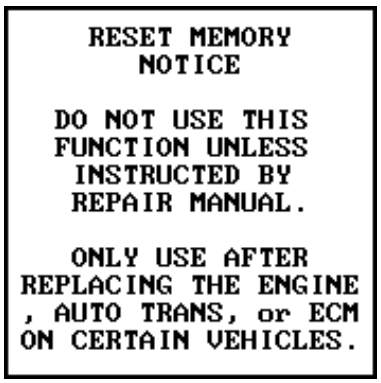
△ ▽	Move cursor to <LONG TERM>, <SHORT TERM>, or <UNIT CONVERSION> selection fields.
◁ ▷	Change the value in the current selection field (<LONG TERM>, <SHORT TERM>, or <UNIT CONVERSION>).
ENTER	Continue with <FUEL CONSUMPTION>.
EXIT	Quit <FUEL CONSUMPTION>.

EVAP SYS CHECK

Press (4) to select <EVAP SYS CHECK> from the <SYSTEM CHECK MENU>. Please reference the Service Manual for this function.

LEVII SYS CHECK

Press (5) to select <LEVII SYS CHECK> from the <SYSTEM CHECK MENU>. Please reference the Service Manual for this function.

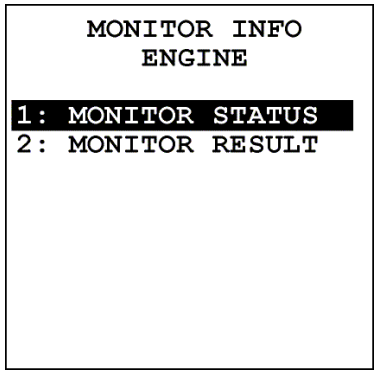


RESET MEMORY

Press (6) to select <RESET MEMORY> from the <DIAGNOSTIC MENU>. The <RESET MEMORY> erases learned values from certain engine, ECM, and automatic transmission ECUs.

ACTIVE KEYS

(YES) Reset the ECM.
(NO) Cancel Reset Memory.



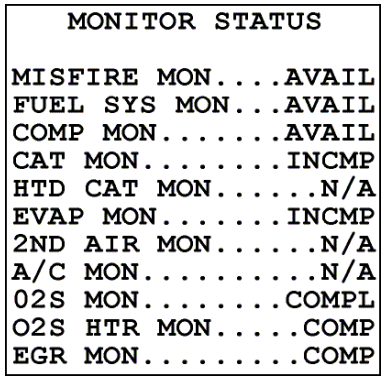
MONITOR INFO

Press (7) to select <MONITOR INFO> from the <DIAGNOSTIC MENU>. The <MONITOR INFO> displays monitored values and related test limits for certain OBD II readiness monitors.

<1: MONITOR STATUS> Review monitored emission sensors.
<2: MONITOR RESULT> Display monitored values.

ACTIVE KEYS

△ ▽ Change highlighted menu item.
(ENTER) Select the highlighted menu entry.
(1) - (2) Select menu item.

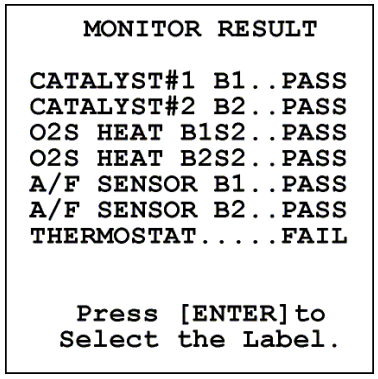


MONITOR STATUS

Press (1) to select <MONITOR STATUS> from the <MONITOR INFO> menu.

ACTIVE KEYS

△ ▽ Change highlighted menu item.



MONITOR RESULTS

Press (2) to select <MONITOR RESULT> from the <MONITOR INFO> menu.

ACTIVE KEYS

△ ▽ Change highlighted menu item.
(ENTER) Select the highlighted menu entry.

CHECK MODE

Press (8) to select <CHECK MODE> from the <DIAGNOSTIC MENU>. If Check Mode is selected, the Tester displays a list of currently stored DTC Info. Review the DTC Info and Freeze Data before proceeding.

Perform the steps displayed on the Tester screen. Press (ENTER) when the steps are completed. If Check Mode is selected, the Tester commands the ECU to automatically run the Once Per Trip tests. <CHECK> is displayed on line 2 of all displays, indicating that the Check Mode is active.

ACTIVE KEYS

(ENTER) Proceed to Check Mode.

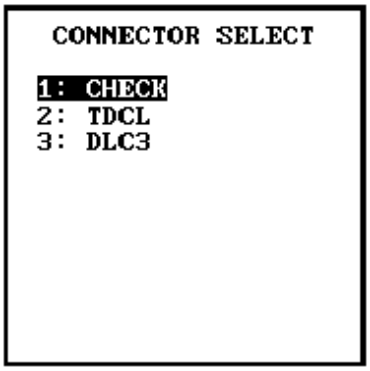
5.0 DIAGNOSTIC CODES (ALL)

Press (1) to select <CODES (ALL)> from the <OBD/MOBD MENU>. The <DIAG. CODES MENU> allows you to view any DTC Info stored in an ECU.

<1: NORMAL MODE>	Display the status of codes that are saved in the various ECUs.
<3: CLEAR AIRBAG>	Clear stored airbag DTC Info.

ACTIVE KEYS

△ ▽	Change highlighted menu item.
(1), (3)	Select menu item.
ENTER	Select highlighted menu item.

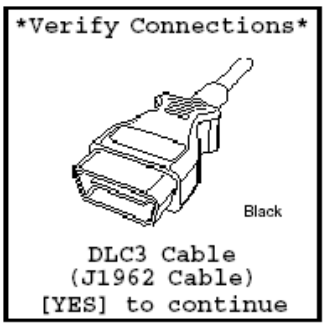


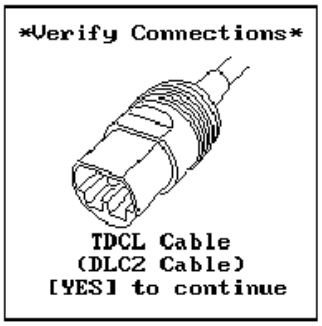
CONNECTOR SELECTION

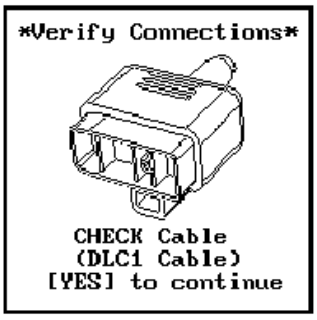
If DTC Info is available on more than one diagnostic connector, choose the connector for diagnosis.

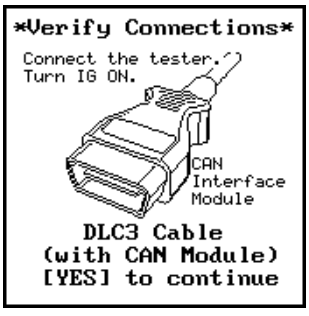
ACTIVE KEYS

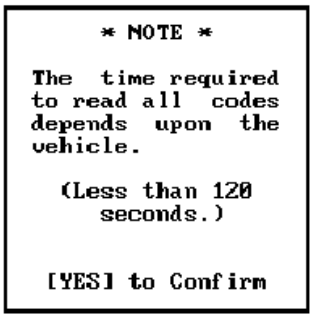
△ ▽	Change highlighted menu item.
(1) - (3)	Select menu item.
ENTER	Select highlighted menu item.











CONNECTION VERIFICATION

Verify that the connector displayed on the Tester is connected to the vehicle.

ACTIVE KEYS

(YES) Proceed with test.
(EXIT) Return to menu.

NORMAL MODE

CHECK CODES SCREEN #1

Press (1) to select <NORMAL MODE> from the <DIAG. CODES MENU>. The display at the left shows the status of codes that have been received from the various ECUs through the DLC1 (Check Connector) or DLC2 (TDCL). The status can either be WAIT, RECEIVING, NG, Err, or OK. You can examine any of the ECUs in detail by highlighting your selection and pressing (ENTER).

ACTIVE KEYS

△ ▽ Change highlighted menu item.
(ENTER) Display codes for highlighted system.

CHECK CODES SCREEN #2

Codes that are present are listed in reverse video. The Check Code screens are similar for other ECUs.

- Each time a code is detected by the ECM/ECU, the description for that code alternates between normal and reverse video.
- The number in the upper right indicates the number of DTC Info.
- When there are more than four codes, press the ▽ key to check the remaining codes.

CLEAR AIRBAG CODES

SCREEN #1

Press (3) to select <CLEAR AIRBAG> from the <DIAG. CODES MENU>. The Tester allows you to clear any DTC Info that have been stored in the Airbag ECU.

ACTIVE KEYS

(YES) Confirm that you wish to clear the Airbag DTC Info.
(EXIT) Return to the <DIAG. CODES MENU> without clearing the DTC Info.

SCREEN #2

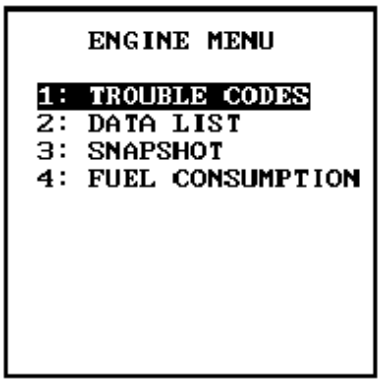
When (YES) is pressed from <CLEAR AIRBAG CODES> screen #1, the Tester indicates that the Airbag ECU codes are being cleared.

SCREEN #3

The Tester informs you that the airbag code clearing function is completed.

ACTIVE KEYS

(EXIT) Return to the <DIAG. CODES MENU>.



6.0 OBD ENGINE MENU

The OBD Engine function is available for select vehicles prior to MY96. For engine diagnosis on MY96 and newer vehicles, see the OBD II Operator's Manual.

<1: TROUBLE CODES>	Displays engine DTC Info.
<2: DATA LIST>	Displays engine data parameters.
<3: SNAPSHOT>	Capture data parameters to isolate faults.
<4: FUEL CONSUMPTION>	Displays fuel consumption rate.

ACTIVE KEYS

△ ▽	Change highlighted menu item.
ENTER	Select the highlighted menu entry.
1 - 4	Select menu item.

TROUBLE CODES

Press 1 to select <TROUBLE CODES> from the <ENGINE MENU>. Until the first Engine code is received, the Tester displays "Waiting for Codes". If the Engine system does not contain any codes, the Tester displays "No Codes Present".

As new codes are received, they are displayed on the Tester. The Tester display continually updates to show all of the current Engine codes; use the △ and ▽ to view all of the codes.

NOTE	The Engine codes transfer rate is very slow. Please wait a sufficient amount of time to ensure all codes have been read by the Tester.

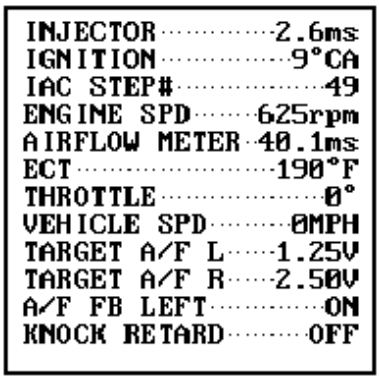
ACTIVE KEYS

△ ▽	Scroll Engine codes.
EXIT	Return to the <ENGINE MENU>.

DATA LIST

Press (2) to select the <DATA LIST> from the <ENGINE MENU>. The Data List displays all data parameters supplied by the ECU.

There are five different modes of display for the DATA LIST: <DATA LIST>, <LED/LIST>, <BAR GRAPH>, <LINE GRAPH>, and <STRIP CHART>. The display mode can be changed by pressing (F1) - (F6).



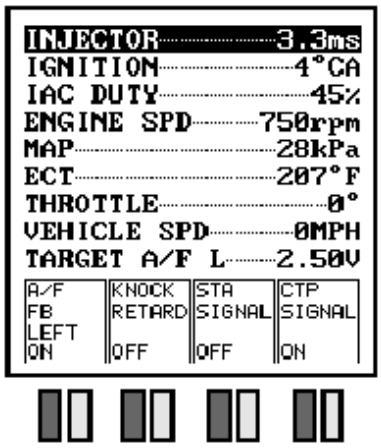
DATA LIST MODE

Press (F1) to select <DATA LIST> mode from any Data List display.

Twelve parameters using large characters or 16 parameters using compressed characters can be displayed at one time. All parameters can be viewed by pressing the up or down keys.

ACTIVE KEYS

△ ▽	Move the display one parameter.
(✱) △	Move the display one page.
(✱) ▽	
(F2)	Go to <LED/LIST> mode.
(F3)	Go to <BAR GRAPH> mode.
(F4)	Go to <LINE GRAPH> mode.
(F6)	Setup <STRIP CHART> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(#) (F8)	Start Strip Chart.
(#) (F9)	Stop Strip Chart.
(✱) (HELP)	Display parameter information.
(SEND)	Print data list.



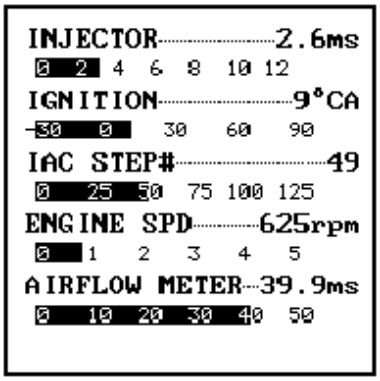
LED/LIST MODE

Press (F2) to select the <LED/LIST> mode from any Data List display. The <LED/LIST> gives you a quick view of the status of four discrete parameters displayed in boxes at the bottom of the Data List display. The <LED/LIST> also allows you to change the order of the displayed parameters.

The status of the discrete parameters is displayed at the bottom of the box and is also indicated by the red and green lights beneath each box. The parameters listed can be selected with the Active Keys.

ACTIVE KEYS

⌃⌄	Move the cursor (highlight) up and down.
(YES)	Change the highlighted parameter to the next parameter in the list.
(NO)	Change the highlighted parameter to the previous parameter in the list.
(✱)(YES)	Change to the next parameter not currently displayed.
(✱)(NO)	Change to the previous parameter not currently displayed.
(F1)	Go to <DATA LIST> mode.
(F3)	Go to <BAR GRAPH> mode.
(F4)	Go to <LINE GRAPH> mode.
(F6)	Setup <STRIP CHART> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(#)(F8)	Start Strip Chart.
(#)(F9)	Stop Strip Chart.
(✱)(HELP)	Display parameter information.
(SEND)	Print data list.

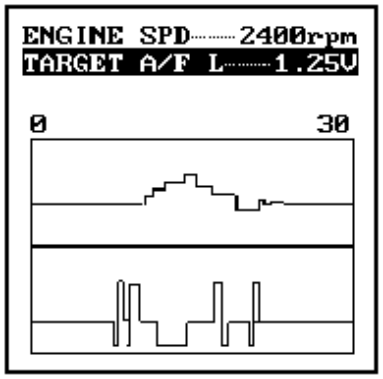


BAR GRAPH MODE

Press (F3) to select the <BAR GRAPH> mode from any Data List display. The <BAR GRAPH> shows relationships among up to five different data parameters (or six parameters using compressed characters). The displayed data parameters can be selected with the Active Keys.

ACTIVE KEYS

△ ▽	Move the cursor (highlight) up and down.
(YES)	Change the highlighted parameter to the next parameter in the list.
(NO)	Change the highlighted parameter to the previous parameter in the list.
(✱)(YES)	Change to the next parameter not currently displayed.
(✱)(NO)	Change to the previous parameter not currently displayed.
(F1)	Go to <DATA LIST> mode.
(F2)	Go to <LED/LIST> mode.
(F4)	Go to <LINE GRAPH> mode.
(F6)	Setup <STRIP CHART> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(#)(F8)	Start Strip Chart.
(#)(F9)	Stop Strip Chart.
(✱)(HELP)	Display parameter information.
(SEND)	Print data list.

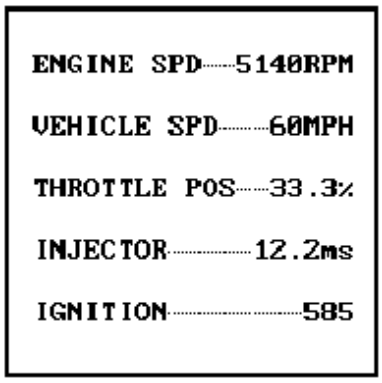


LINE GRAPH MODE

Press (F4) to select the <LINE GRAPH> mode from any Data List display. The <LINE GRAPH> displays two data parameters on the moving line graph. The displayed data parameters can be selected with the Active Keys.

ACTIVE KEYS

◁ ▷	Change Line Graph time scale. Allowable scales are 10, 30, 60, and 100 seconds.
△ ▽	Move the cursor (highlight) up and down.
(YES)	Change the highlighted parameter to the next parameter in the list.
(NO)	Change the highlighted parameter to the previous parameter in the list.
(F1)	Go to <DATA LIST> mode.
(F2)	Go to <LED/LIST> mode.
(F3)	Go to <BAR GRAPH> mode.
(F6)	Setup <STRIP CHART> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(#)(F8)	Start Strip Chart.
(#)(F9)	Stop Strip Chart.
(✱)(HELP)	Display parameter information.
(SEND)	Print data list.



STRIP CHART MODE

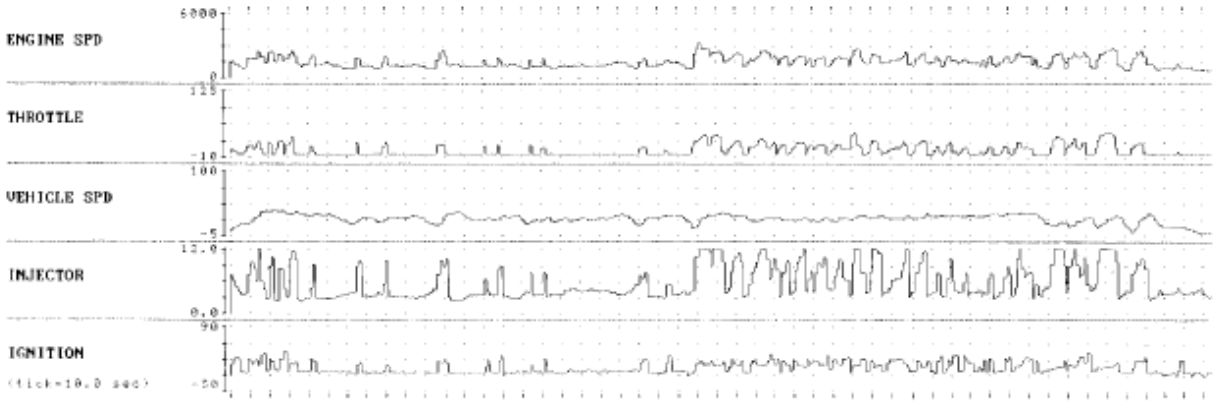
NOTE	This function requires the optional VP-411/414 printer.

Press (F6) to select the <STRIP CHART> setup from any Data List display. The <STRIP CHART> allows you to select up to five parameters to be printed. The Strip Chart mode only works with the optional VP-411/414 printer. Press (#)(F8) to start the Strip Chart printing. Live data is printed until it is turned off with (#)(F9) or when you exit Data List.

ACTIVE KEYS

↑↓	Move the cursor (highlight) up and down.
(YES)	Change the highlighted parameter to the next parameter in the list.
(NO)	Change the highlighted parameter to the previous parameter in the list.
(✱)(YES)	Change to the next parameter not currently displayed.
(✱)(NO)	Change to the previous parameter not currently displayed.
(F1)	Go to <DATA LIST> mode.
(F2)	Go to <LED/LIST> mode.
(F3)	Go to <BAR GRAPH> mode.
(F4)	Go to <LINE GRAPH> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(#)(F8)	Start Strip Chart.
(#)(F9)	Stop Strip Chart.
(✱)(HELP)	Display parameter information.
(SEND)	Print data list.

SAMPLE OF STRIP CHART PRINTOUT



SNAPSHOT MODE

Press (3) to select the <SNAPSHOT> mode from the <ENGINE MENU>. The Snapshot test mode helps you isolate an intermittent problem by storing all data parameters before and/or after the problem occurs. Setup instructions for the snapshot options are explained in detail on the following pages.

<1: MANUAL SNAPSHOT>	The snapshot can be triggered manually by pressing (ENTER).
<2. CODES SNAPSHOT>	The snapshot can be triggered with the ar rival of any engine Trouble Code.
<3: REPLAY SNAPSHOT>	Display a previously saved snapshot.
<4: TRIGGER POINT>	Selects the data to be captured relative to the trigger point.

ACTIVE KEYS

△ ▽	Change highlighted menu item.
(1) - (4)	Select a snapshot option.
(ENTER)	Select highlighted menu item.

MANUAL SNAPSHOT

Press (1) to select the <MANUAL SNAPSHOT> mode from the <SNAPSHOT MENU>. Vehicle data is continually saved in a buffer in the Tester. Press (ENTER) to mark the trigger and continue to save data until the trigger time expires.

DATA CAPTURE PHASE

The <LINE GRAPH> mode of the Data List appears. Use the left and right keys to select the desired time scale for the snapshot before trigger. <Wait: Manual Trigger> is displayed at the bottom of the screen until the snapshot is triggered. Press the (ENTER) key to trigger the snapshot and begin capturing data. When a trigger occurs, <Trigger> is displayed at the bottom of the screen while data is being saved.

ACTIVE KEYS

◁ ▷	Select snapshot capture time scale. Allowable time scales are 10, 30, 60, and 100 seconds. (<LINE GRAPH> mode only.)
△ ▽	Move the display up or down one parameter.
(✱) △	Move the display one page. (<DATA LIST> mode only.)
(✱) ▽	
(YES)	Change the highlighted parameter to the next parameter in the list. (<LED/LIST>, <BAR GRAPH>, and <LINE GRAPH> modes only.)
(NO)	Change the highlighted parameter to the previous parameter in the list. (<LED/LIST>, <BAR GRAPH>, and <LINE GRAPH> modes only.)
(✱)(YES)	Change to the next parameter not currently displayed. (<LED/LIST>, <BAR GRAPH>, and <LINE GRAPH> modes only.)
(✱)(NO)	Change to the previous parameter not currently displayed. (<LED/LIST>, <BAR GRAPH>, and <LINE GRAPH> modes only.)
(ENTER)	Trigger the Snapshot and terminates data capture.
(F1)	Go to <DATA LIST> mode.
(F2)	Go to <LED/LIST> mode.
(F3)	Go to <BAR GRAPH> mode.
(F4)	Go to <LINE GRAPH> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(✱)(HELP)	Display parameter information.
(SEND)	Print data list.

SNAPSHOT SAVE

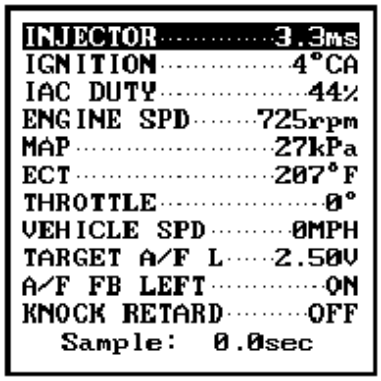
After completion of the data capture, the snapshot can be saved for later review.

Press (YES) to save this data set or (NO) to continue without saving the data. The current snapshot can be reviewed immediately even if not saved.

HINT	The snapshot data is stored on the Program Card. Make sure that the same Program Card is used when reviewing stored snapshot data.

ACTIVE KEYS

(YES)	Save snapshot data.
(NO)	Continue to Data Display phase without saving snapshot data.



DATA DISPLAY PHASE

At the completion of the data capture phase, <Sample> and a time stamp are displayed at the bottom of the screen. The trigger point is indicated by a sample of 0.0 sec. All data samples have a time stamp relative to the trigger. For a 50% trigger and 30-second data capture, the Tester displays samples from -15.0 seconds to 15.0 seconds.

Data captured in the Snapshot mode can be displayed in all of the formats that are available in the <DATA LIST> mode, except for Strip Chart.

ACTIVE KEYS

△ ▽	Move the display up or down one parameter.
(✱)△	Move the display one page. (<DATA LIST> mode only.)
(✱)▽	
◁ ▷	Sequence through the sample displayed.
(YES)	Change the highlighted parameter to the next parameter in the list. (<LED/LIST>, <BAR GRAPH> and <LINE GRAPH> modes only.)
(NO)	Change the highlighted parameter to the previous parameter in the list. (<LED/LIST>, <BAR GRAPH>, and <LINE GRAPH> modes only.)
(✱)(YES)	Change to the next parameter not currently displayed. (<LED/LIST>, <BAR GRAPH>, and <LINE GRAPH> modes only.)
(✱)(NO)	Change to the previous parameter not currently displayed. (<LED/LIST>, <BAR GRAPH>, and <LINE GRAPH> modes only.)
(F1)	Go to <DATA LIST> mode.
(F2)	Go to <LED/LIST> mode.
(F3)	Go to <BAR GRAPH> mode.
(F4)	Go to <LINE GRAPH> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(✱)(HELP)	Display parameter information.
(SEND)	Print data list.

CODES SNAPSHOT

Press (2) to select <CODES SNAPSHOT> from the <SNAPSHOT MENU>. The operation of <CODES SNAPSHOT> is identical to <MANUAL SNAPSHOT> except the trigger occurs when any engine Trouble Code is set.

DATA CAPTURE PHASE

The <LINE GRAPH> mode of the Data List appears. Use the left and right keys to select the desired time scale for the snapshot before trigger. Use the up and down keys to select a data parameter. <Wait: Select Trigger> is displayed until the snapshot is triggered. After a trigger occurs, <Trigger> is displayed. You can also trigger the snapshot manually by pressing the (ENTER) key.

ACTIVE KEYS

◁ ▷	Select snapshot capture time scale. Allowable time scales are 10, 30, 60, and 100 seconds.
△ ▽	Move the display up or down one parameter.
(✱) △	Move the display one page. (<DATA LIST> mode only.)
(✱) ▽	
(YES)	Change the highlighted parameter to the next parameter in the list. (<LED/LIST>, <BAR GRAPH>, and <LINE GRAPH> modes only.)
(NO)	Change the highlighted parameter to the previous parameter in the list. (<LED/LIST>, <BAR GRAPH>, and <LINE GRAPH> modes only.)
(✱) (YES)	Change to the next parameter not currently displayed. (<LED/LIST>, <BAR GRAPH>, and <LINE GRAPH> modes only.)
(✱) (NO)	Change to the previous parameter not currently displayed. (<LED/LIST>, <BAR GRAPH>, and <LINE GRAPH> modes only.)
(F1)	Go to <DATA LIST> mode.
(F2)	Go to <LED/LIST> mode.
(F3)	Go to <BAR GRAPH> mode.
(F4)	Go to <LINE GRAPH> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(✱) (HELP)	Display parameter information.
(SEND)	Print data list.

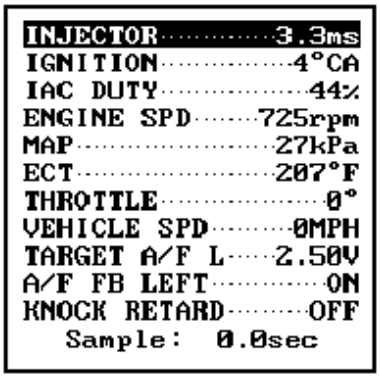
SNAPSHOT SAVE

After completion of the data capture, the snapshot can be saved for later review.

Press (YES) to save this data set or (NO) to continue without saving the data. The current snapshot can be reviewed immediately even if not saved.

ACTIVE KEYS

(YES)	Save snapshot data.
(NO)	Go to Data Display phase without saving snapshot data.



DATA DISPLAY PHASE

At the completion of the data capture phase, <Sample> and a time stamp are displayed at the bottom of the screen. The trigger point is indicated by a sample of 0.0 sec. All data samples have a time stamp relative to the trigger. For a 50% trigger and 30-second data capture, the Tester displays samples from -15.0 seconds to 15.0 seconds.

Data captured in the <SNAPSHOT> mode can be displayed in all of the formats that are available in the <DATA LIST> mode, except for Strip Chart.

ACTIVE KEYS

◁ ▷ Sequence through the sample displayed.
△ ▽ Move the display up or down one parameter.
✱ △ Move the display one page. (<DATA LIST> mode only.)
✱ ▽
YES Change the highlighted parameter to the next parameter in the list. (<LED/LIST>, <BAR GRAPH>, and <LINE GRAPH> modes only.)
NO Change the highlighted parameter to the previous parameter in the list. (<LED/LIST>, <BAR GRAPH>, and <LINE GRAPH> modes only.)
✱ YES Change to the next parameter not currently displayed. (<LED/LIST>, <BAR GRAPH>, and <LINE GRAPH> modes only.)
✱ NO Change to the previous parameter not currently displayed. (<LED/LIST>, <BAR GRAPH>, and <LINE GRAPH> modes only.)
F1 Go to <DATA LIST> mode.
F2 Go to <LED/LIST> mode.
F3 Go to <BAR GRAPH> mode.
F4 Go to <LINE GRAPH> mode.
F9 Change between large and compressed character size.
F0 Turn cursor on and off.
✱ HELP Display parameter information.
SEND Print data list.

REPLAY SNAPSHOT

Press (3) to select <REPLAY SNAPSHOT> mode from the <SNAPSHOT MENU>. Snapshot Event Replay options are listed below:

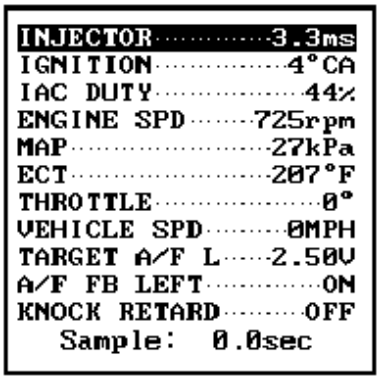
ACTIVE KEYS

▲ ▼	Move the cursor (highlight) up and down.
(ENTER)	Display the vehicle information of the selected snapshot data.
(✱)(ENTER)	Delete selected snapshot from the list.

The vehicle information of the selected snapshot data is displayed.

ACTIVE KEY

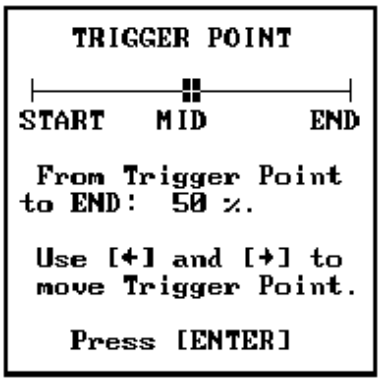
(ENTER)	Display selected snapshot data.



The data parameters which were captured during the event are displayed. The Data Display phase is indicated by <Sample> and a time stamp.

ACTIVE KEYS

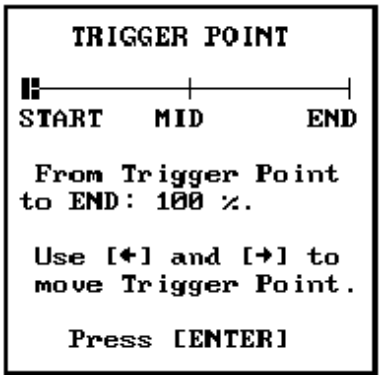
◁ ▷	Sequence through the sample displayed.
▲ ▼	Move the display up or down one parameter.
(✱)▲	Move the display one page. (<DATA LIST> mode only.)
(✱)▼	
(YES)	Change the highlighted parameter to the next parameter in the list. (<LED/LIST>, <BAR GRAPH>, and <LINE GRAPH> modes only.)
(NO)	Change the highlighted parameter to the previous parameter in the list. (<LED/LIST>, <BAR GRAPH>, and <LINE GRAPH> modes only.)
(✱)(YES)	Change to the next parameter not currently displayed. (<LED/LIST>, <BAR GRAPH>, and <LINE GRAPH> modes only.)
(✱)(NO)	Change to the previous parameter not currently displayed. (<LED/LIST>, <BAR GRAPH>, and <LINE GRAPH> modes only.)
(F1)	Go to <DATA LIST> mode.
(F2)	Go to <LED/LIST> mode.
(F3)	Go to <BAR GRAPH> mode.
(F4)	Go to <LINE GRAPH> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(✱)(HELP)	Display parameter information.
(SEND)	Print data list.



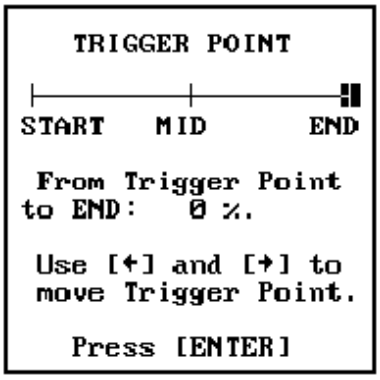
TRIGGER POINT

Press (4) to select <TRIGGER POINT> from the <SNAPSHOT MENU>. <TRIGGER POINT> allows you to choose how much data to save after the trigger.

The display at the left stores 50% of the data before and 50% of the data after the trigger point.



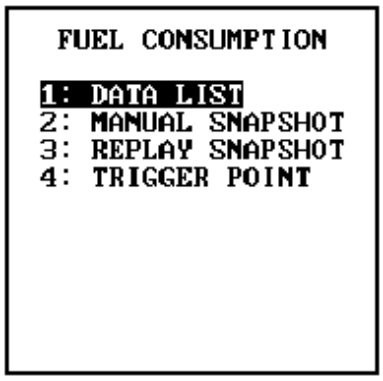
The display at the left stores 100% of the data after the trigger point.



The display at the left stores no data after the trigger point.

ACTIVE KEYS

◁ ▷ Move the trigger point marker left or right.
(ENTER) Confirm trigger point setting and return to the <SNAPSHOT MENU>.



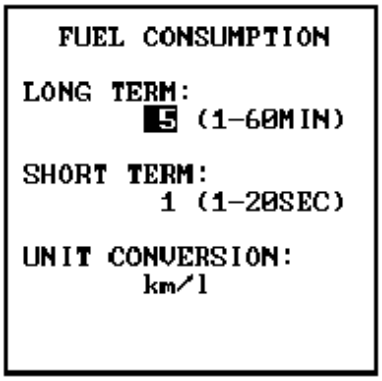
FUEL CONSUMPTION MENU

Press (4) to select <FUEL CONSUMPTION> from the <ENGINE MENU>. The following menu options are available:

<1: DATA LIST>	Display fuel consumption parameters.
<2: MANUAL SNAPSHOT>	Capture fuel consumption parameters.
<3: REPLAY SNAPSHOT>	Replay fuel consumption snapshots.
<4: TRIGGER POINT>	Set snapshot trigger point.

ACTIVE KEYS

⌃⌄	Change highlighted menu item.
(ENTER)	Select the highlighted menu entry.
(1) - (4)	Select menu item.



FUEL CONSUMPTION SETUP

This screen appears after selecting <DATA LIST> or <MANUAL SNAPSHOT> from the <FUEL CONSUMPTION> menu. You can select the time frames that fuel consumption averaging will be performed over for both the long and short term averages. Also, the units to be displayed can be selected using this screen.

HINT

The following units are available for fuel consumption calculation:

km/l	= Distance per litre
l/100 km	= Litre per 100 km
MPG	= Distance per Gallon (3.8l)
MPIG	= Distance per Imperial Gallon (4.5l)

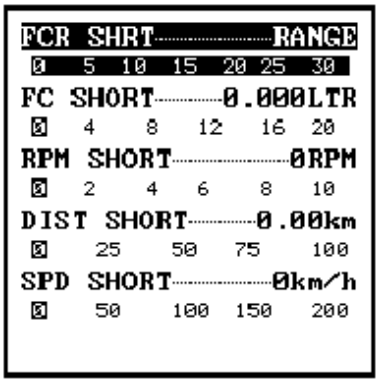
ACTIVE KEYS

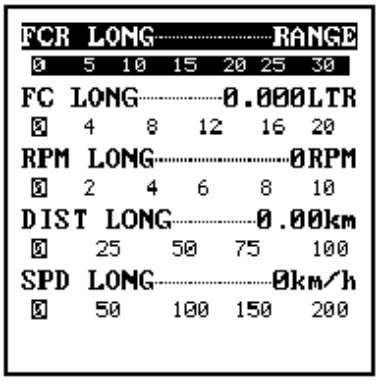
⌃⌄	Move cursor to <LONG TERM>, <SHORT TERM>, or <UNIT CONVERSION> selection fields.
◁▷	Change the value in the current selection field (<LONG TERM>, <SHORT TERM>, or <UNIT CONVERSION>).
(ENTER)	Continue with <FUEL CONSUMPTION>.
(EXIT)	Quit <FUEL CONSUMPTION>.

DATA LIST

Press (1) to select the <DATA LIST> mode from the <FUEL CONSUMPTION SETUP> menu. The Data List displays all of the fuel consumption parameters.

There are three different modes of display for the Fuel Consumption Data List: <DATA LIST>, <BAR GRAPH>, and <LINE GRAPH>.



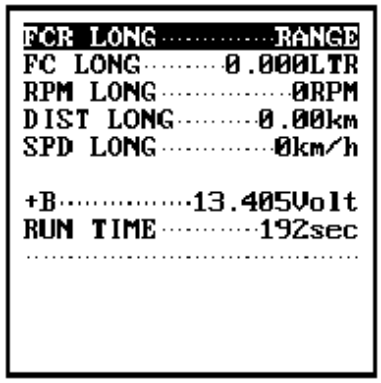


BAR GRAPH MODE

Press (F3) to select the <BAR GRAPH> mode from any Data List display.

ACTIVE KEYS

△ ▽	Move the cursor (highlight) up and down.
(YES)	Change the highlighted parameter to the next parameter in the list.
(NO)	Change the highlighted parameter to the previous parameter in the list.
(✱)(YES)	Change to the next parameter not currently displayed.
(✱)(NO)	Change to the previous parameter not currently displayed.
(F1)	Go to <DATA LIST> mode.
(F4)	Go to <LINE GRAPH> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(✱)(ENTER)	Reset the short and long term averaging for fuel consumption calculations.
(✱)(F1)	Change the units of the displayed parameters (MPG, LTR/100 km, km/LTR, MPIG).
(✱)▷	Change between long and short term displays.
(✱)◁	Change between long and short term displays.
(SEND)	Print data list.
(✱)(SEND)	Print screen.



DATA LIST MODE

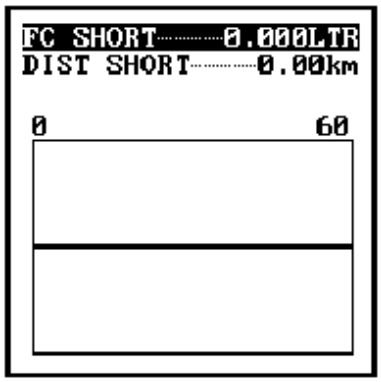
Press (F1) to select <DATA LIST> mode from any Data List display.

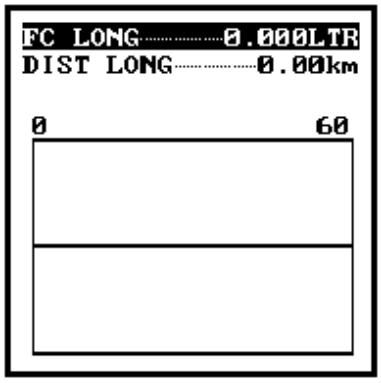
ACTIVE KEYS

△ ▽	Move the display one parameter.
✱ △	Move the display one page.
✱ ▽	
F3	Go to <BAR GRAPH> mode.
F4	Go to <LINE GRAPH> mode.
F9	Change between large and compressed character size.
F0	Turn cursor on and off.
✱ ENTER	Reset the short and long term averaging for fuel consumption calculations.
✱ F1	Change the units of the displayed parameters (MPG, LTR/100 km, km/ LTR, MPIG).
✱ ▷	Change between long and short term displays.
✱ ◁	Change between long and short term displays.
SEND	Print data list.
✱ SEND	Print screen.

PARAMETER DEFINITION

Description of Parameter	Unit	Max.	Min./Digit	Remarks
FCR: Fuel Consumption Ratio/Average for required time period	KM/L MPG L/100 MPIG	99	0.0	
FC: Integrated Fuel Consumption for required time period	LTR Gallon Imp Gal	100.00	0.00	
RPM: Average Engine RPM over required time period	RPM	9999	0	
DIST Distance for required time period	Km Mile	300	0	
SPD Average Vehicle Speed for required time period	Km/h MPH	300	0	





LINE GRAPH MODE

Press (F4) to select the <LINE GRAPH> mode from any Data List display.

ACTIVE KEYS

◁ ▷	Change the line graph time scale. Allowable scales are 10, 30, 60 and 100, 300, and 600 seconds. (At Active Test scale is fixed to 30 seconds.)
△ ▽	Move the cursor (highlight) up and down.
(YES)	Change the highlighted parameter to the next parameter in the list.
(NO)	Change the highlighted parameter to the previous parameter in the list.
(F1)	Go to <DATA LIST> mode.
(F3)	Go to <BAR GRAPH> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(✱)(ENTER)	Reset the short and long term averaging for fuel consumption calculations.
(✱)(F1)	Change the units of the displayed parameters (MPG, LTR/100 km, km/LTR, MPIG).
(✱)▷	Change between long and short term displays.
(✱)◁	Change between long and short term displays.
(SEND)	Print data list.
(✱)(SEND)	Print screen.

MANUAL SNAPSHOT MODE

Press (2) to select <MANUAL SNAPSHOT> from the <FUEL CONSUMPTION> menu. This mode is similar in operation to the <MANUAL SNAPSHOT> for the <CURRENT DATA> menu.

REPLAY SNAPSHOT MODE

Press (3) to select <REPLAY SNAPSHOT> from the <FUEL CONSUMPTION> menu. This mode is similar in operation to the <REPLAY SNAPSHOT> for the <CURRENT DATA> menu.

TRIGGER POINT MODE

Press (4) to select <TRIGGER POINT> from the <FUEL CONSUMPTION> menu. This mode is similar in operation to the <TRIGGER POINT> for the <CURRENT DATA> menu.

7.0 AIR SUSPENSION

Toyota vehicles use two different types of Air Suspension ECU.

- OBD DTC Info
- Multiplex-OBD (M-OBD)

The diagnostic functions available vary between the different ECU types. The connector used for diagnosis can provide a clue as to the type of ECU the vehicle has.

- OBD ECUs are diagnosed using either the CHECK or TDCL.
- M-OBD ECUs are diagnosed using the DLC3.

The diagnostic test modes for each ECU type are described separately. See Section 7.1: OBD AIR SUSPENSION and Section 7.2: M-OBD AIR SUSPENSION.

7.1 OBD AIR SUSPENSION

The Air Suspension mode allows you to test the Air Suspension system.

For Operating Procedures for the Data List, DTC Info, Active Test, and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽ Change highlighted menu item.
ENTER Select highlighted menu item.
1 - 4 Select a menu option.

TROUBLE CODES

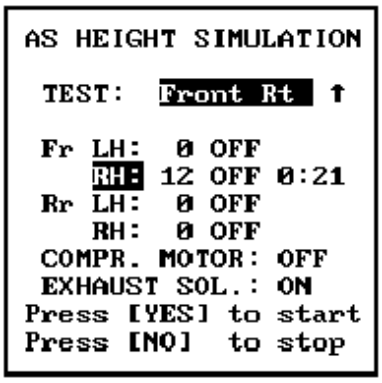
Press 1 to select <TROUBLE CODES> from the <AIR SUSPENSION> menu. Until the first Air Suspension code is received, the Tester displays "Waiting for Codes". If the Air Suspension system does not contain any codes, the Tester displays "No Codes Present".

As new codes are received, they are displayed on the Tester. The Tester display continually updates to show all of the current Air Suspension codes; use the △ and ▽ to view all of the codes.

NOTE	The Air Suspension codes transfer rate is very slow. Please wait a sufficient amount of time to ensure all codes have been read by the Tester.

ACTIVE KEYS

△ ▽ Scroll Air Suspension Codes.
EXIT Return to the <AIR SUSPENSION MENU>.



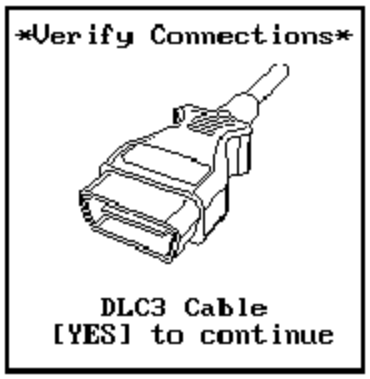
HEIGHT SIMULATION

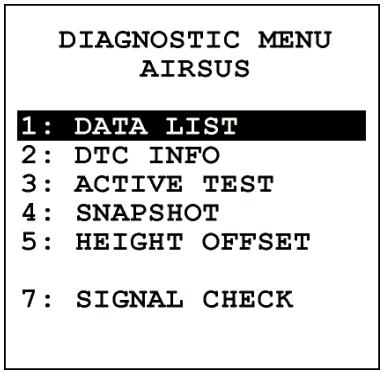
Press (4) to select <HEIGHT SIM. TEST> from the <AIR SUSPENSION> menu. The first line allows you to select which wheel is to be tested and the direction the car body will travel for the test. The next four lines are status lines which show the height data and valve positions for each wheel. A timer indicates how long the test has run for the highlighted wheel. The status of the compressor motor and the exhaust valve solenoid are displayed below the wheel data. Press (YES) to start the test. Press (NO) to terminate the test.

ACTIVE KEYS

△ ▽ Select wheel position. Status line of wheel to be tested is highlighted. If the up arrow is highlighted, select the direction of test (up or down).
◁ ▷ Select wheel position or direction.
(YES) Confirm that you wish to start the Air Suspension Height Simulation test.
(NO) Stop test from being conducted.
(EXIT) Return to the <AIR SUSPENSION MENU>.

NOTE	Do not drive the vehicle while the Height Simulation test is being performed.





7.2 M-OBD AIR SUSPENSION

The M-OBD Air Suspension System provides enhanced diagnostic functions and procedures. The M-OBD Air Suspension System is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, DTC Info, Active Test, and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
(1) - (5), (7)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to previous menu.

HEIGHT OFFSET

Press (5) to select <HEIGHT OFFSET> from the <DIAGNOSTIC MENU>. The Height Control sensors are used by the Height Control ECU to determine normal vehicle height. Refer to the diagnostic section of the Repair Manual before performing this function.

SIGNAL CHECK

Press (7) to select <SIGNAL CHECK> from the <DIAGNOSTIC MENU>. The Signal Check is used to verify that the ECU is receiving all signals.

8.0 ABS

Toyota vehicles use two different types of ABS ECU:

- OBD DTC Info
- Multiplex-OBD (M-OBD)

The diagnostic functions available vary between the different ECU types. The connector used for diagnosis can provide a clue as to the type of ECU the vehicle has.

- OBD ECUs are diagnosed using either the CHECK or TDCL.
- M-OBD ECUs are diagnosed using the DLC3.

The diagnostic test modes for each ECU type are described separately. See Section 8.1: OBD ABS CODES, and Section 8.2: M-OBD ABS.

8.1 OBD ABS CODES

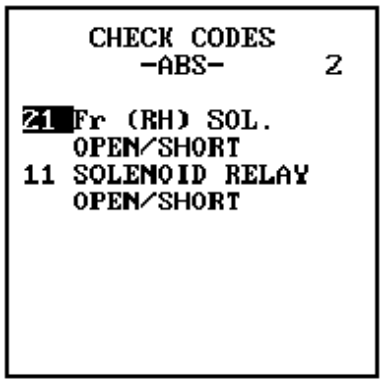
Until the first ABS Code is received, the Tester displays "Waiting for Codes". If the ABS system does not contain any codes, the Tester displays "No Codes Present".

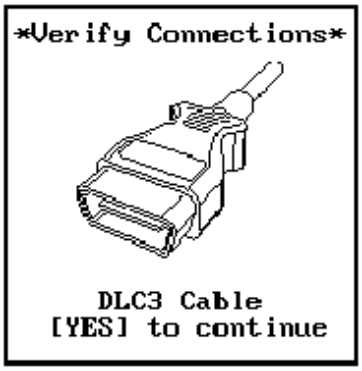
As new codes are received, they are displayed on the Tester. The Tester display continually updates to show all of the current ABS codes; use ⌃ and ⌄ to view all of the codes.

NOTE	The ABS codes transfer rate is very slow. Please wait a sufficient amount of time to ensure all codes have been read by the Tester.

ACTIVE KEYS

⌃ ⌄ Scroll ABS Codes.
EXIT Return to the <ABS MENU>.



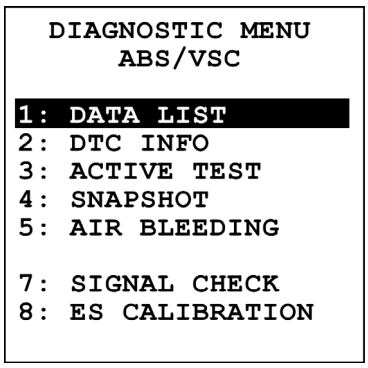


8.2 M-OBD ABS

The M-OBD ABS System provides enhanced diagnostic functions and procedures. The M-OBD ABS System is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, DTC Info, Active Test, and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

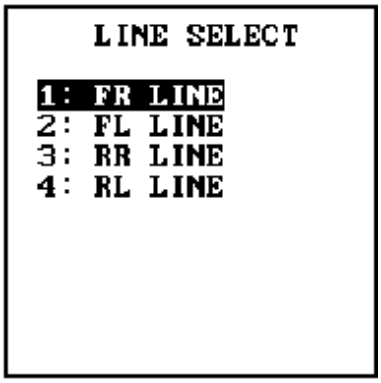
△ ▽ Change to next/previous menu item.
① - ⑤, ⑦ Select menu item.
ENTER Select highlighted menu item.
EXIT Return to the previous menu.



AIR BLEEDING

For some vehicles, the Tester is used to perform the Air Bleeding procedure. The Air Bleeding function only appears in the menu if the currently selected vehicle supports the function.

Refer to the service manual for the Air Bleeding procedure.



On the Tester, select the brake line to bleed.

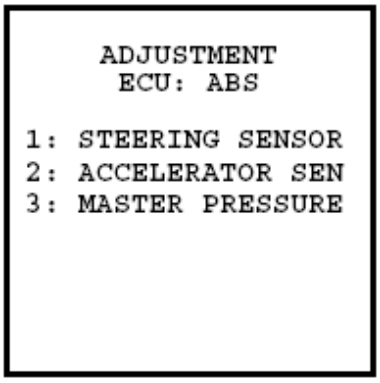
ACTIVE KEYS

△ ▽ Change to next/previous menu item.
① - ④ Select menu item.
ENTER Select highlighted menu item.
EXIT Return to the previous menu.

The Air Bleeding procedure takes a total of 8 seconds. Use the ▷ and ◁ keys to start and stop the Air Bleeding process. After the completion of the Air Bleeding process, a resting period is required. Please wait until the Tester indicates that the Air Bleeding is complete.

ACTIVE KEYS

◁ ▷ Start and stop the Air Bleeding process.
EXIT Abort the procedure.



ADJUSTMENT

For some vehicles the tester is used to adjust ABS sensors.

The Adjustment option only appears if the selected vehicle supports the steering, accelerator, sensor, and Master Pressure functions.

STEERING SENSOR ADJUSTMENT

Please reference the Service Manual for the Steering Sensor Adjustment procedure.

ACCELERATOR SENSOR ADJUSTMENT

Please reference the Service Manual for the Accelerator Sensor Adjustment procedure.

MASTER PRESSURE ADJUSTMENT

Please reference the Service Manual for the Master Pressure Adjustment procedure.

SIGNAL CHECK

Press (7) to select <SIGNAL CHECK> from the <DIAGNOSTIC> Menu. The SIGNAL CHECK function is used to check the sensor signals of ABS through actual operation of the vehicle (e.g., driving). Refer to the diagnostic section of the Repair Manual before performing this function.

ACTIVE KEYS

(ENTER) Select to continue.
(EXIT) Abort signal check.

9.0 IMMOBILISER

Toyota vehicles use two different types of Immobiliser ECUs:

- OBD Codes
- Multiplex-OBD (M-OBD)

The diagnostic functions available vary between the different ECU types. The connector used for diagnosis can provide a clue as to the type of ECU the vehicle has.

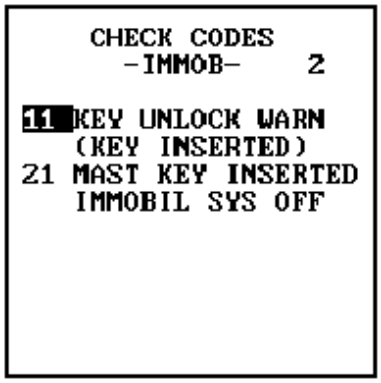
- OBD ECUs are diagnosed using either the CHECK or TDCL.
- M-OBD ECUs are diagnosed using the DLC3.

The diagnostic test modes for each ECU type are described separately. See Section 9.1: OBD Immobiliser Codes, and Section 9.2: M-OBD Immobiliser with Key Code Utility.

9.1 OBD IMMOBILISER CODES[2]

The Immobiliser function allows you to view the current state of the Immobiliser system.

Until the first Immobiliser code is received, the Tester displays "Waiting for Codes".



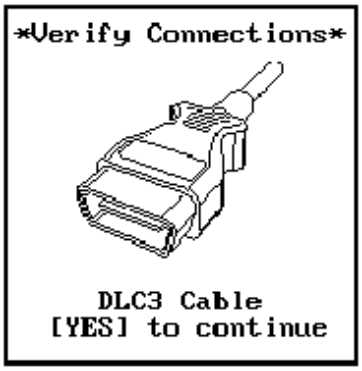
As new codes are received, they are displayed on the Tester. The Tester display continually updates to show all of the current Immobiliser codes; use the △ and ▽ to view all of the codes.

NOTE	The Immobiliser codes transfer rate is very slow. Please wait a sufficient amount of time to ensure all codes have been read by the Tester.

ACTIVE KEYS

△▽ Scroll Immobiliser codes.
EXIT Return to the <OBD MENU>.

2 The Immobiliser System diagnosis is only available using the optional VIM Version 3 (Vetronix Part Number 02002047).

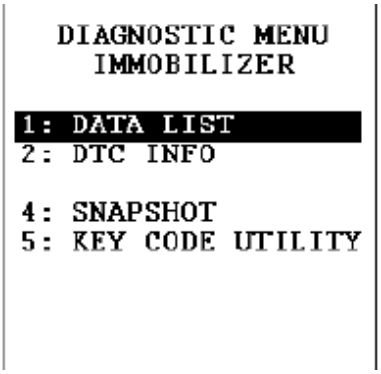


9.2 M-OBD IMMOBILISER WITH KEY CODE UTILITY

The M-OBD Immobiliser System provides enhanced diagnostic functions and procedures. The M-OBD Immobiliser System is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, DTC Info, and Snapshot functions please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
①, ②, ④, ⑤	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.



KEY CODE UTILITY

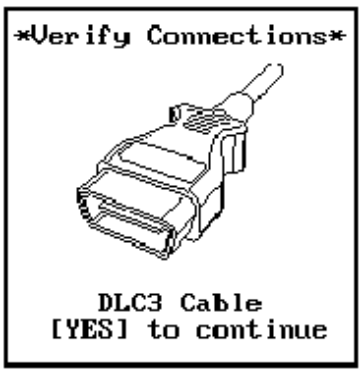
The Key Code Utilities are used to add new key codes or clear key codes in the Immobiliser system. Refer to the service manual before performing any of these procedures.

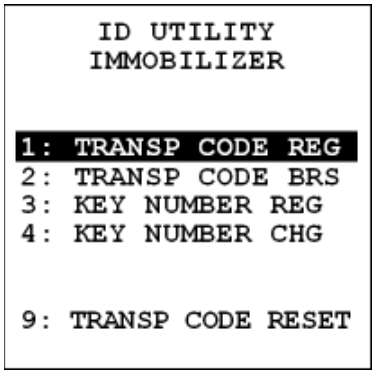
The following procedures are available:

<KEY REGISTRATION>	Register a new Master or Sub key.
<KEY CODE ERASURE>	Delete all key codes except the Master key in the key cylinder.
<AUTO REG CLOSURE>	Terminate auto-registration of keys for new Immobiliser/ Engine ECU.
<KEY CODE RESET>	Resets Key Code.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
①, ③, ⑨	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to previous menu.





9.3 M-OBD IMMOBILISER WITH ID UTILITY

The M-OBD Immobiliser System provides enhanced diagnostic functions and procedures. The M-OBD Immobiliser System is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, DTC Info, Active Test, and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

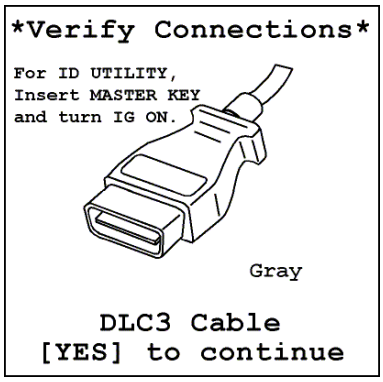
△ ▽	Change to next/previous menu item.
(1) - (5)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.

ID UTILITY

Some vehicles provide additional diagnostic functionality supporting wireless security features. These vehicles display an additional menu selection option, <5: ID UTILITY>.

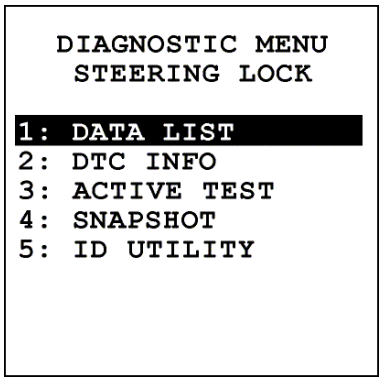
ACTIVE KEYS

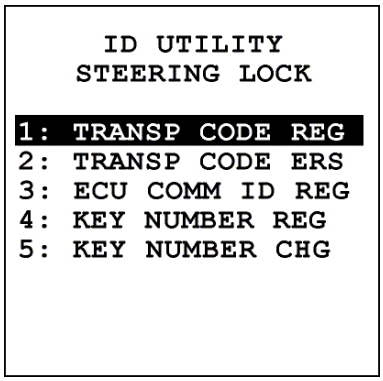
△ ▽	Change to next/previous menu item.
(1) - (4), (9)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to previous menu.



10.0 STEERING LOCK

The M-OBD Steering Lock System provides enhanced diagnostic functions and procedures. The M-OBD Steering Lock System is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, DTC Info, Active Test, and Snapshot functions, please refer to Section 4.0: M-OBD Functions.





ID UTILITY

After selecting (5) from the Diagnostic Menu, please proceed to the desired ID Utility function by choosing a menu item with keys (1) - (5)

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
(1) - (5)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to previous menu.

11.0 CCS (CRUISE CONTROL SYSTEM)

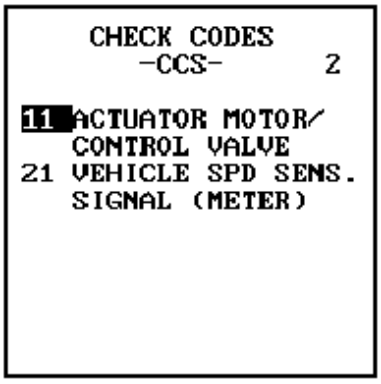
Toyota vehicles use two different types of CCS ECUs:

- OBD DTC Info
- Multiplex-OBD (M-OBD)

The diagnostic functions available vary between the different ECU types. The connector used for diagnosis can provide a clue as to the type of ECU the vehicle has.

- OBD ECUs are diagnosed using either the CHECK or TDCL.
- M-OBD ECUs are diagnosed using the DLC3.

The diagnostic test modes for each ECU type are described separately. See Section 11.1: OBD CCS DTC INFO, and Section 11.2: M-OBD CCS.



11.1 OBD CCS DTC INFO

The CCS function allows you to view the current state of the CCS system.

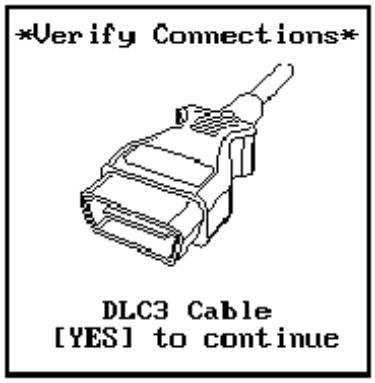
Until the first CCS code is received, the Tester displays "Waiting for Codes". If the CCS system does not contain any codes, the Tester displays "No Codes Present".

As new codes are received, they are displayed on the Tester. The Tester display continually updates to show all of the current CCS codes; use the △ and ▽ to view all of the codes.

NOTE	The CCS codes transfer rate is very slow. Please wait a sufficient amount of time to ensure all codes have been read by the Tester.

ACTIVE KEYS

△ ▽ Scroll CCS codes.
EXIT Return to the <OBD MENU>.

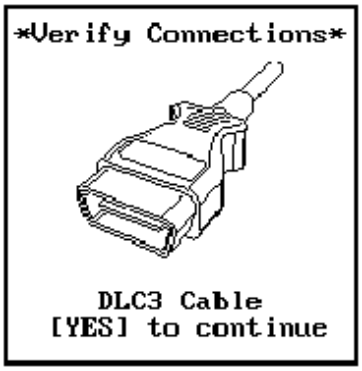


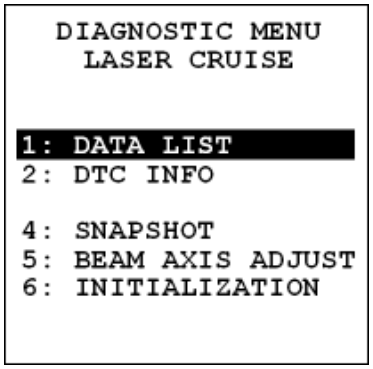
11.2 M-OBD CCS

The M-OBD CCS system provides enhanced diagnostic functions and procedures. The M-OBD CCS system is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, DTC Info, and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
(1), (2), (4)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to previous menu.





12.0 LASER CRUISE

The M-OBD Laser Cruise system provides enhanced diagnostic functions and procedures. The M-OBD Laser Cruise system is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, DTC Info, and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
①, ②, ④ - ⑥	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.

BEAM AXIS ADJUSTMENT

Press ⑥ to select <BEAM AXIS ADJUST> from the <DIAGNOSTIC MENU>. Please reference the Service Manual for specific instructions on Beam Axis Adjustment.

INITIALIZATION

Press ⑤ to select <INITIALIZATION> from the <DIAGNOSTIC MENU>. Please reference the Service Manual for the Sensor Adjustment procedure.

13.0 AIR CONDITIONING

Toyota vehicles use two different types of Air Conditioning ECUs:

- OBD DTC Info
- Multiplex-OBD (M-OBD)

The diagnostic functions available vary between the different ECU types. The connector used for diagnosis can provide a clue as to the type of ECU the vehicle has.

- OBD ECUs are diagnosed using either the CHECK or TDCL.
- M-OBD ECUs are diagnosed using the DLC3.

The diagnostic test modes for each ECU type are described separately. See Section 13.1: OBD Air Conditioning DTC Info, and Section 13.2: M-OBD Air Conditioning.

13.1 OBD AIR CONDITIONING DTC INFO

The Air Conditioning function allows you to view the current state of the Air Conditioning system.

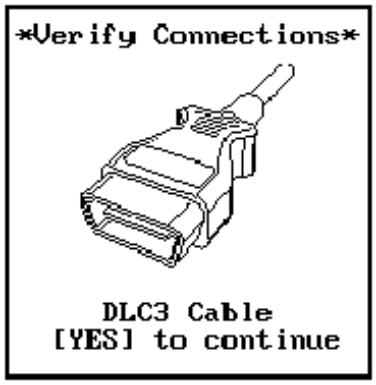
Until the first Air Conditioning code is received, the Tester displays "Waiting for Codes". If the Air Conditioning system does not contain any codes, the Tester displays "No Codes Present".

As new codes are received, they are displayed on the Tester. The Tester display continually updates to show all of the current Air Conditioning codes; use the △ and ▽ to view all of the codes.

NOTE	The Air Conditioning codes transfer rate is very slow. Please wait a sufficient amount of time to ensure all codes have been read by the Tester.

ACTIVE KEYS

△ ▽ Scroll Air Conditioning codes.
EXIT Return to the <OBD MENU>.



13.2 M-OBD AIR CONDITIONING

The M-OBD Air Conditioning system provides enhanced diagnostic functions and procedures. The M-OBD Air Conditioning system is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, DTC Info, Active Test, and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
(1) - (4)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to previous menu.

14.0 TRACTION CONTROL

The Traction Control function allows you to view the current state of the Traction Control system.

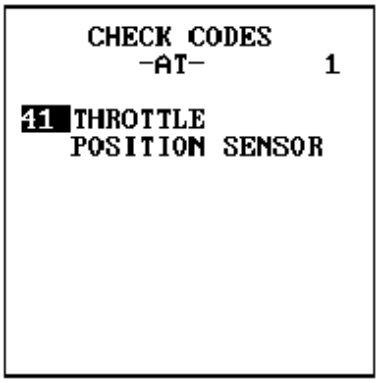
Until the first Traction Control code is received, the Tester displays "Waiting for Codes". If the Traction Control system does not contain any codes, the Tester displays "No Codes Present".

As new codes are received, they are displayed on the Tester. The Tester display continually updates to show all of the current Traction Control codes; use the △ and ▽ to view all of the codes.

NOTE	The Traction Control codes transfer rate is very slow. Please wait a sufficient amount of time to ensure all codes have been read by the Tester.

ACTIVE KEYS

△ ▽ Scroll Traction Control codes.
(EXIT) Return to the <OBD MENU>.



15.0 ECT

The ECT function allows you to view the current state of the ECT system.

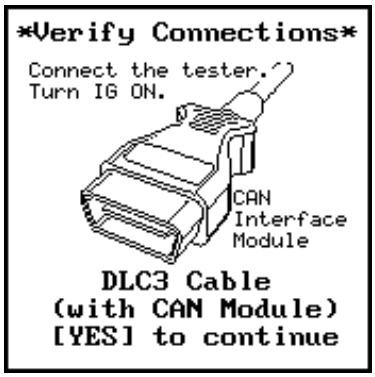
Until the first ECT code is received, the Tester displays "Waiting for Codes". If the ECT system does not contain any codes, the Tester displays "No Codes Present".

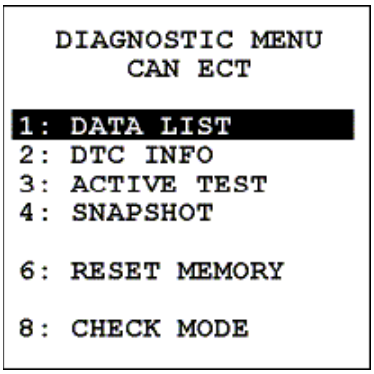
As new codes are received, they are displayed on the Tester. The Tester display continually updates to show all of the current ECT codes; use the △ and ▽ to view all of the codes.

NOTE	The ECT codes transfer rate is very slow. Please wait a sufficient amount of time to ensure all codes have been read by the Tester.

ACTIVE KEYS

△ ▽ Scroll ECT codes.
EXIT Return to the <OBD MENU>.





15.1 CAN ECT

The CAN ECT provides enhanced diagnostic functions for the ECT system. The CAN ECT is diagnosed using the Tester connected to CAN Module. Please verify the correct vehicle connection. For Operating Procedures for the Data List, DTC Info, Active Test, Snapshot, Reset and Check Mode functions, please refer to Section 4.0: M-OBD Functions.

Operating Procedures for the DTC Info function are described in Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
(1) - (4), (6), (8)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.

16.0 AIRBAG

Toyota vehicles use three different types of Airbag controllers:

- OBD Airbag
- OBD Side Airbag
- Multiplex-OBD (M-OBD) Airbag/Supplemental Restraint System (SRS)

The diagnostic functions available vary depending on the type of Airbag controller. The connector used for diagnosis provides a clue to the type of controller the vehicle has.

- OBD Airbag and Side Airbag controllers are diagnosed using either the CHECK or TDCL connectors.
- M-OBD controllers are diagnosed using the DLC3 connector.

The diagnostic modes for each type of Airbag controller are described separately in this manual. See Section 16.1: OBD AIRBAG, Section 16.2: SIDE AIRBAG, and Section 16.3: M-OBD AIRBAG/SRS.

16.1 OBD AIRBAG

The OBD Airbag function allows you to view the current state of the Airbag system and clear any Trouble Codes.

<1: TROUBLE CODES> View Airbag codes.
<2: CLEAR AIRBAG> Clear Airbag codes.

ACTIVE KEYS

△ ▽ Change highlighted menu item
ENTER Select highlighted menu item.
① - ② Select menu item.

TROUBLE CODES

Until the first Airbag code is received, the Tester displays "Waiting for Codes". If the Airbag system does not contain any codes, the Tester displays "No Codes Present".

As new codes are received, they are displayed on the Tester. The Tester display continually updates to show all of the current Airbag codes; use the △ and ▽ to view all of the codes.

NOTE	The Airbag codes transfer rate is very slow. Please wait a sufficient amount of time to ensure all codes have been read by the Tester.

ACTIVE KEYS

△ ▽ Scroll Airbag codes.
EXIT Return to the <OBD MENU>.

CLEAR AIRBAG CODES

SCREEN #1

Press (2) to select <CLEAR AIRBAG> from the <AIRBAG> menu. The Tester allows you to clear any DTC Info that have been stored in the Airbag ECU.

ACTIVE KEYS

(YES) Confirm that you wish to clear the Airbag DTC Info.
(EXIT) Return to the <DIAG. CODES MENU> without clearing the DTC Info.

SCREEN #2

When (YES) is pressed from <CLEAR AIRBAG CODES> screen #1, the Tester indicates that the Airbag ECU codes are being cleared.

SCREEN #3

The Tester informs you that the airbag code clearing function is completed.

ACTIVE KEYS

(EXIT) Return to the <DIAG. CODES MENU>.

16.2 SIDE AIRBAG

The Side Airbag function allows you to view the current state of the Side Airbag system.

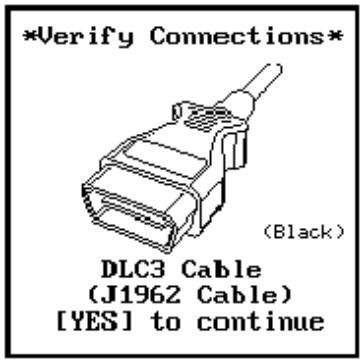
Until the first Side Airbag code is received, the Tester displays "Waiting for Codes". If the Side Airbag system does not contain any codes, the Tester displays "No Codes Present".

As new codes are received, they are displayed on the Tester. The Tester display continually updates to show all of the current Side Airbag codes; use the △ and ▽ to view all of the codes.

NOTE	The Side Airbag codes transfer rate is very slow. Please wait a sufficient amount of time to ensure all codes have been read by the Tester.

ACTIVE KEYS

△ ▽ Scroll Side Airbag codes.
EXIT Return to the <OBD MENU>.

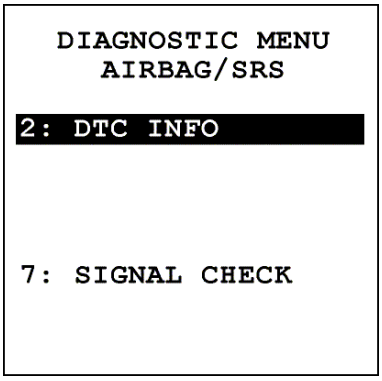


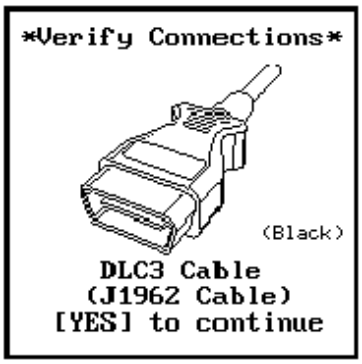
16.3 M-OBD AIRBAG/SRS

The M-OBD Airbag/Supplemental Restraint System (SRS) provides enhanced diagnostic functions for the Airbag/SRS. The M-OBD Airbag/SRS is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. Operating Procedures for the DTC Info function are described in Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
(2), (7)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.



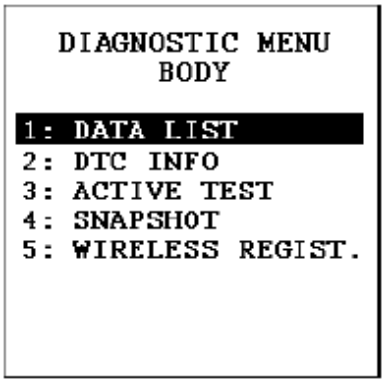


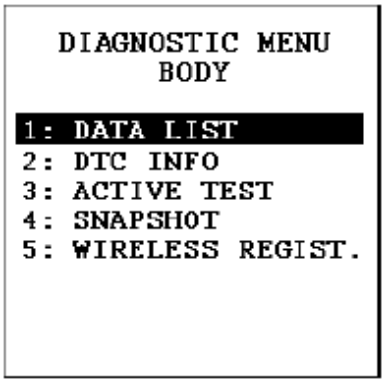
17.0 PRE-COLLISION SAFETY

The M-OBD Pre-Collision Safety system provides enhanced diagnostic functions and procedures. The M-OBD Pre-Collision Safety system is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, DTC Info, Active Test, and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽ Change to next/previous menu item.
(1) - (4) Select menu item.
ENTER Select highlighted menu item.
EXIT Return to the previous menu.





18.0 BODY

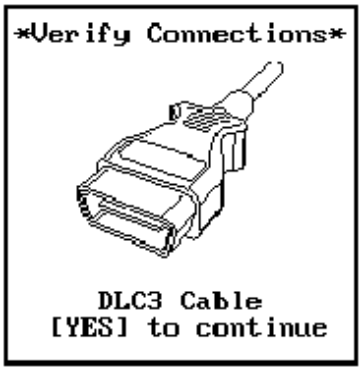
The M-OBD Body system provides enhanced diagnostic functions and procedures. The M-OBD Body system is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, DTC Info, Active Test, and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
(1) - (5)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.

WIRELESS REGISTRATION

Please reference the Service Manual for the Wireless Registration procedure.

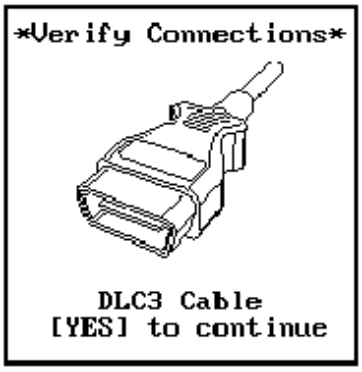


19.0 GATEWAY

The M-OBD Gateway system provides enhanced diagnostic functions and procedures. The M-OBD Gateway system is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the DTC Info, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
(2)	Select menu item.
(ENTER)	Select highlighted menu item.
(EXIT)	Return to the previous menu.

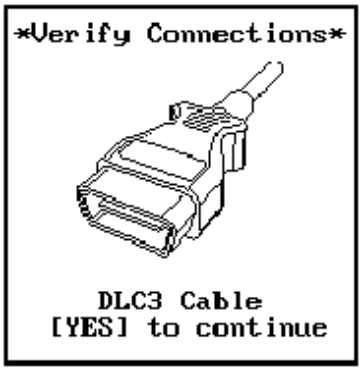


20.0 BODY NUMBER 2

The M-OBD Body Number 2 system provides enhanced diagnostic functions and procedures. The M-OBD Body Number 2 system is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, DTC Info, Active Test, and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
(1) - (4)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.

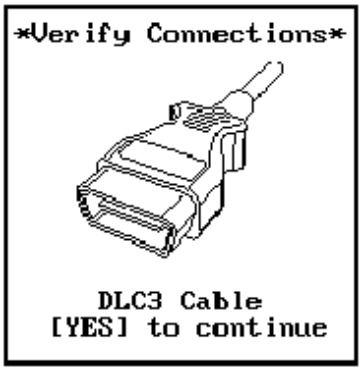


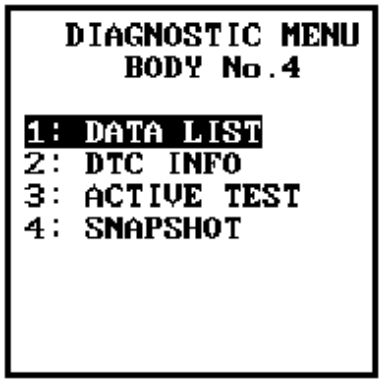
21.0 BODY NUMBER 3

The M-OBD Body Number 3 system provides enhanced diagnostic functions and procedures. The M-OBD Body Number 3 system is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, Active Test, and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
(1),(3),(4)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.



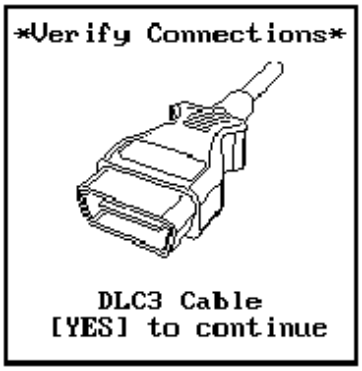


22.0 BODY NUMBER 4

The M-OBD Body Number 4 system provides enhanced diagnostic functions and procedures. The M-OBD Body Number 4 system is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, DTC Info, Active Test, and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
(1) - (4)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.

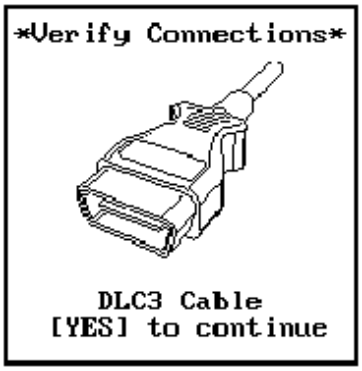


23.0 BODY NUMBER 5

The M-OBD Body Number 5 system provides enhanced diagnostic functions and procedures. The M-OBD Body Number 5 system is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, Active Test, and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
(1), (3), (4)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.

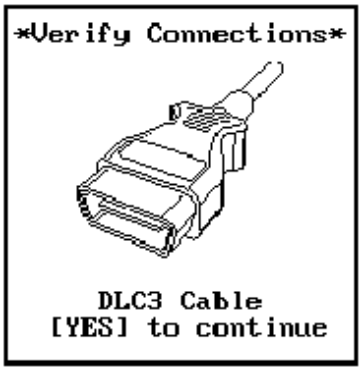


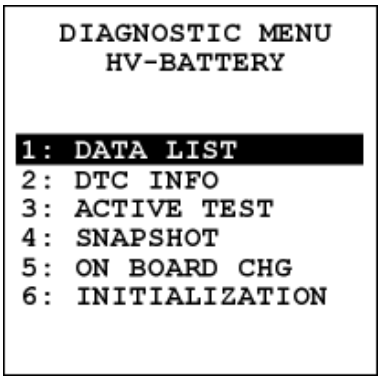
24.0 HYBRID VEHICLE ECU

The M-OBD Hybrid Vehicle ECU system provides enhanced diagnostic functions and procedures. The M-OBD Hybrid Vehicle ECU system is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, DTC Info, Active Test, and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
(1) - (4)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.





25.0 HYBRID VEHICLE BATTERY

The M-OBD Hybrid Vehicle Battery system provides enhanced diagnostic functions and procedures. The M-OBD Hybrid Vehicle Battery system is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, DTC Info, Active Test, and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

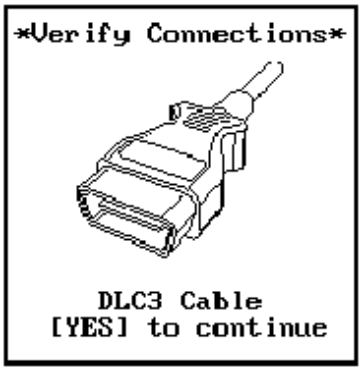
△ ▽	Change to next/previous menu item.
(1) - (6)	Select menu item.
(ENTER)	Select highlighted menu item.
(EXIT)	Return to the previous menu.

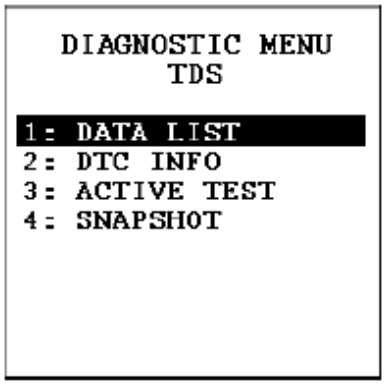
ON BOARD CHARGE

Please reference the Service Manual for the On Board Charge procedure.

INITIALIZE HV BATTERY

Please reference the Service Manual for the Initialize HV Battery procedure.



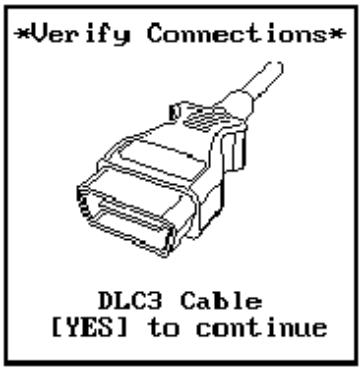


26.0 THEFT DETERRENT SYSTEM (TDS)

The M-OBD Theft Deterrent System (TDS) provides enhanced diagnostic functions and procedures. The M-OBD Theft Deterrent System (TDS) is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, DTC Info, Active Test, and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
(1) - (4)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.



26.1 THEFT DETERRENT SYSTEM (TDS) WIRELESS

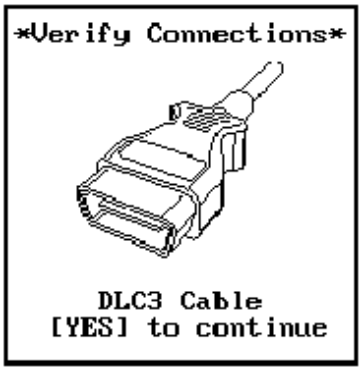
The M-OBD Theft Deterrent System (TDS) provides enhanced diagnostic functions and procedures. The M-OBD Theft Deterrent System (TDS) is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, DTC Info, Active Test, and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

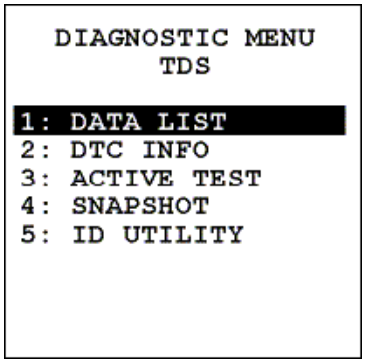
ACTIVE KEYS

△ ▽	Change to next/previous menu item.
(1) - (6)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.

WIRELESS REGISTRATION AND WIRELESS DIAGNOSIS

Please reference the Service Manual for these functions.



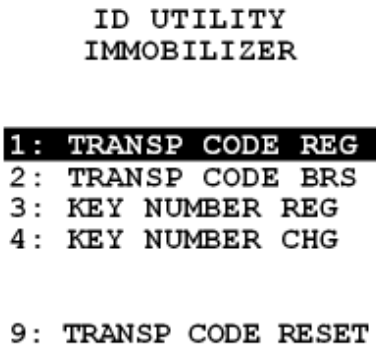


27.0 SMART KEY

The M-OBD Smart Key system provides enhanced diagnostic functions and procedures. The M-OBD Smart Key is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, DTC Info, Active Test and Snapshot function, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
(1) - (5)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.

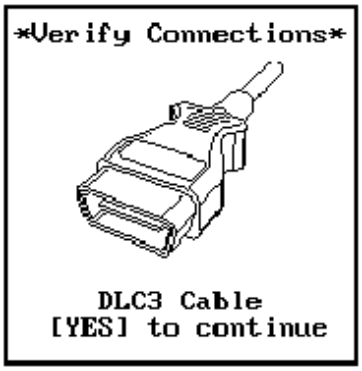


ID UTILITY

Some vehicles provide additional diagnostic functionality supporting wireless security features. These vehicles display an additional menu selection option, <5: ID UTILITY>. After selecting (5) from the Diagnostic Menu, please proceed to the desired ID Utility function by choosing a menu item with keys (1), (2), or (9).

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
(1), (2), (9)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to previous menu.

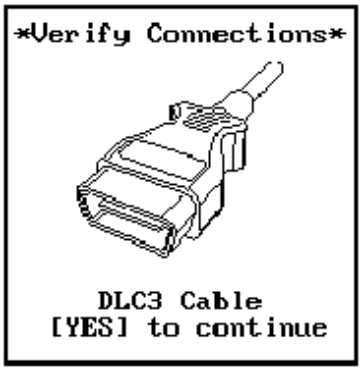


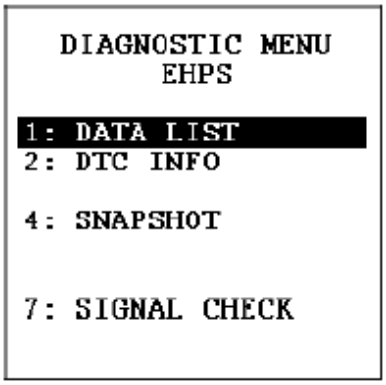
28.0 CLEARANCE SONAR

The M-OBD Clearance Sonar system provides enhanced diagnostic functions and procedures. The M-OBD Clearance Sonar system is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, DTC Info, Active Test, and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
(1) - (4)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.





29.0 EHPS

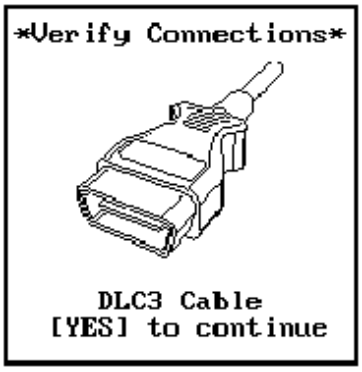
The M-OBD EHPS provides enhanced diagnostic functions and procedures. The M-OBD EHPS is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, DTC Info, and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
①, ②, ④, ⑦	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.

SIGNAL CHECK

Press ⑦ to select <SIGNAL CHECK> from the <DIAGNOSTIC MENU>. The Signal Check function is used to verify that the ECU is receiving all signals.

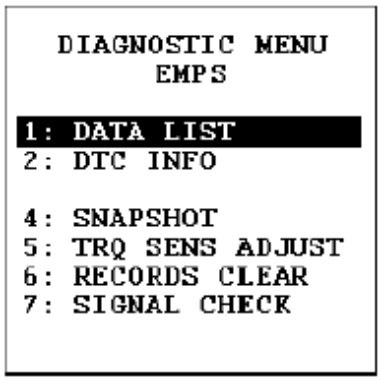


30.0 EMPS (ELECTRIC MOTOR-ASSISTED POWER STEERING)

The M-OBD EMPS system provides enhanced diagnostic functions and procedures. The M-OBD EMPS system is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. Depending on the specific vehicle configuration, the menu selection for Records Clearance may not appear. For Operating Procedures for the Data List, DTC Info, and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
①, ②, ④ - ⑦	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.



TRQ SENSOR ADJUST

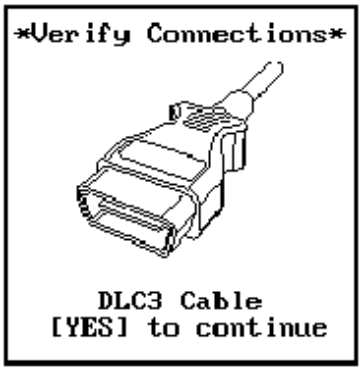
Press ⑤ to select <TRQ SENS ADJUST> from the <DIAGNOSTIC MENU>. The TRQ SENS ADJUST function is used to initialize and adjust the zero point for steering. Please reference the Service Manual for the Torque Sensor Adjustment procedure.

RECORDS CLEAR

Press ⑥ to select <RECORDS CLEAR> from the <DIAGNOSTIC MENU>. The RECORDS CLEAR function is used to clear particular error data from target ECU.

SIGNAL CHECK

Press ⑦ to select <SIGNAL CHECK> from the <DIAGNOSTIC MENU>. The SIGNAL CHECK function is used to check the EMPS sensor signals. Refer to the service manual before performing this function.

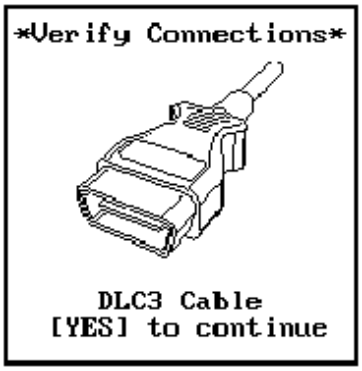


31.0 POWER SOURCE CONTROL

The M-OBD Power Source Control provides enhanced diagnostic functions and procedures. The M-OBD Power Source Control is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, DTC Info, Active Test, and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
(1) - (4)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.



32.0 KDSS

The M-OBD KDSS provides enhanced diagnostic functions and procedures. The M-OBD KDSS is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, DTC Info, Active Test, and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

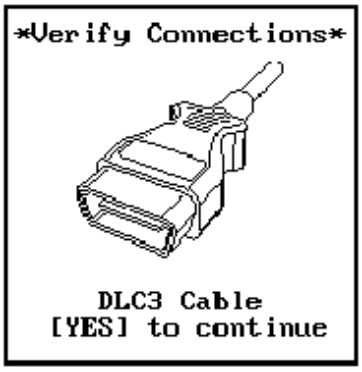
△ ▽	Change to next/previous menu item.
① - ④, ⑥, ⑦	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.

TRQ SENSOR ADJUST

Press ⑥ to select <SENSOR ADJUST> from the <DIAGNOSTIC MENU>. Please reference the Service Manual for the Torque Sensor Adjustment procedure.

SIGNAL CHECK

Press ⑦ to select <SIGNAL CHECK> from the <DIAGNOSTIC MENU>. Refer to the service manual before performing this function.

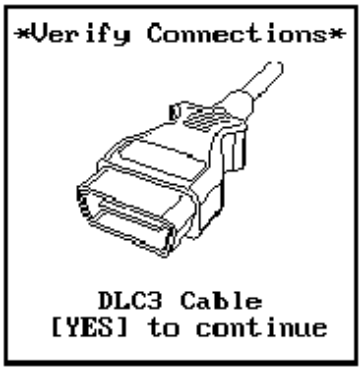


33.0 RAIN SENSOR

The M-OBD Rain Sensor provides enhanced diagnostic functions and procedures. The M-OBD Rain Sensor is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

(1), (4)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.

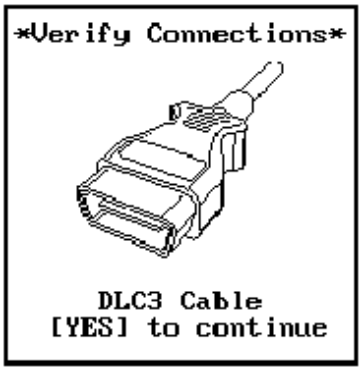


34.0 T/M CONTROL

The M-OBD T/M Control provides enhanced diagnostic functions and procedures. The M-OBD T/M Control is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, DTC Info and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

(1), (2), (4) Select menu item.
(ENTER) Select highlighted menu item.
(EXIT) Return to the previous menu.

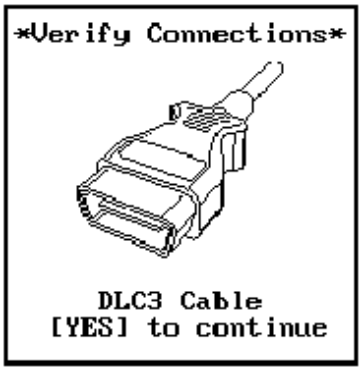


35.0 STEERING PAD

The M-OBD Steering Pad system provides enhanced diagnostic functions and procedures. The M-OBD Steering Pad system is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

(1), (4)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.



36.0 DOOR (D-DOOR, P-DOOR, RL-DOOR, RR-DOOR)

The M-OBD Door system provides enhanced diagnostic functions and procedures. The M-OBD Door system is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, DTC Info, Active Test, and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

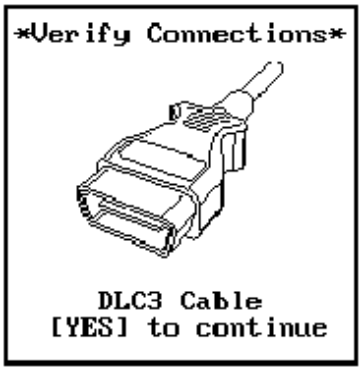
△ ▽	Change to next/previous menu item.
① - ④	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.

BACK DOOR

The M-OBD Back Door system provides enhanced diagnostic functions and procedures. The M-OBD Back Door system is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, DTC Info, Snapshot, and Active Test functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
① - ④	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.



37.0 SEAT (D-SEAT, P-SEAT, RL-SEAT, RR-SEAT)

The M-OBD Seat system provides enhanced diagnostic functions and procedures. The M-OBD Seat system is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, Active Test, and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

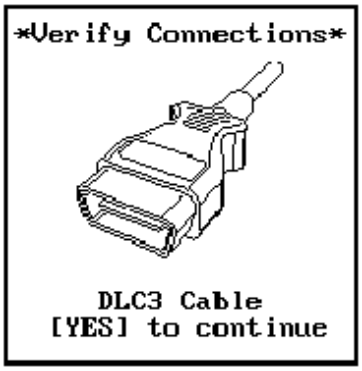
△ ▽	Change to next/previous menu item.
(1), (3), (4)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.

REAR-SEAT SWITCH

The M-OBD Rear-Seat SW system provides enhanced diagnostic functions and procedures. The M-OBD Rear-Seat SW system is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

(1), (4)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.

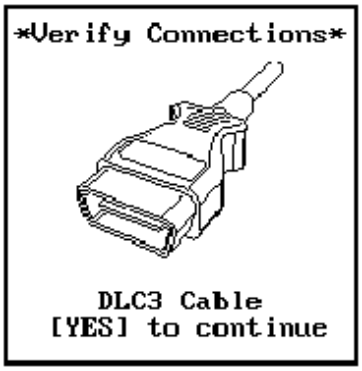


38.0 SLIDE-ROOF

The M-OBD Slide-Roof system provides enhanced diagnostic functions and procedures. The M-OBD Slide-Roof system is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, Snapshot, and Active Test functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
(1), (3), (4)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.

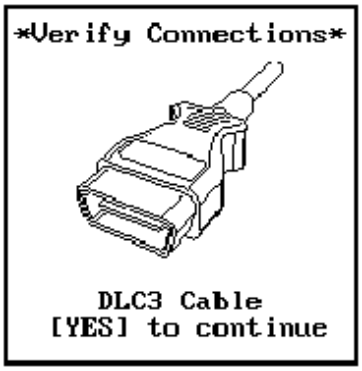


39.0 TILT AND TELESCOPIC

The M-OBD Tilt and Telescopic system provides enhanced diagnostic functions and procedures. The M-OBD Tilt and Telescopic system is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, DTC Info, Active Test, and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
(1) - (4)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.

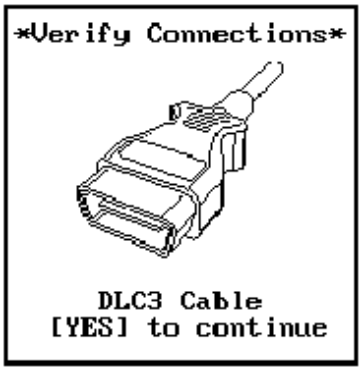


40.0 METER

The M-OBD Meter system provides enhanced diagnostic functions and procedures. The M-OBD Meter system is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, Active Test, and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
(1), (3), (4)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.

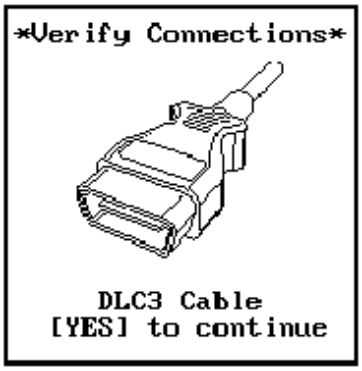


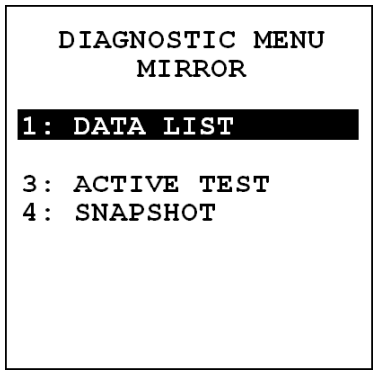
41.0 COMBINATION SWITCH

The M-OBD Combination Switch system provides enhanced diagnostic functions and procedures. The M-OBD Combination Switch system is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
(1), (4)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.



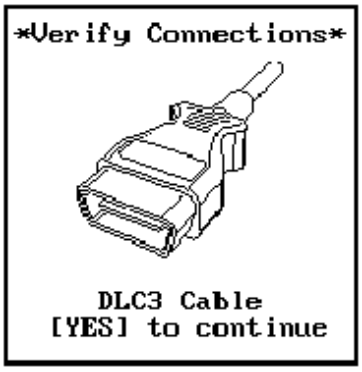


42.0 MIRROR (MIRROR-L, MIRROR-R)

The M-OBD Mirror system provides enhanced diagnostic functions and procedures. The M-OBD Mirror system is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, Active Test, and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
(1), (3), (4)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.

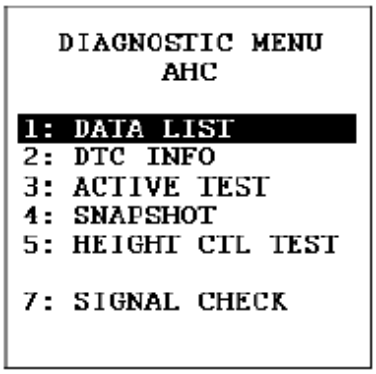


43.0 AHC (ACTIVE HEIGHT CONTROL SUSPENSION)

The M-OBD AHC system provides enhanced diagnostic functions and procedures. The M-OBD AHC system is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, DTC Info, Active Test, and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
(1) - (5), (7)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.



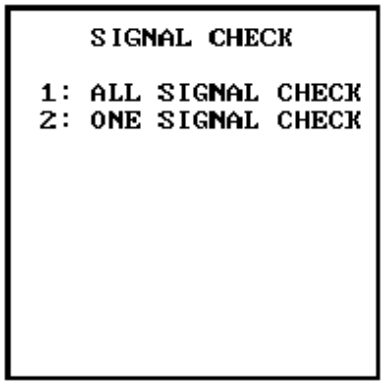
HEIGHT CONTROL TEST
1: FRONT HEIGHT
2: REAR HEIGHT
If DTC of C1763 is set, this test will not be performed.
Verify C1763 is not set before starting.

HEIGHT CONTROL TEST

Press (5) to select <HEIGHT CTL TEST> from the <DIAGNOSTIC MENU>. The Height Control function is used to perform an active test on the height control function of the suspension system. Please reference the Service Manual for the Height Control procedures. For the control of the active test, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
(1), (2)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.



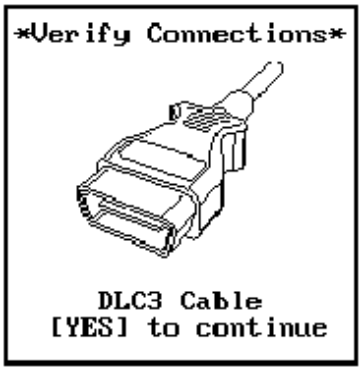
SIGNAL CHECK

Press (7) to select <SIGNAL CHECK> from the <DIAGNOSTIC MENU>. The Signal Check function is used to check the AHC sensor signals. Refer to the diagnostic section of the Repair Manual before performing this function.

<ALL SIGNAL CHECK>	Check all sensor signals.
<ONE SIGNAL CHECK>	Check one selected sensor signal.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
(1), (2)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.

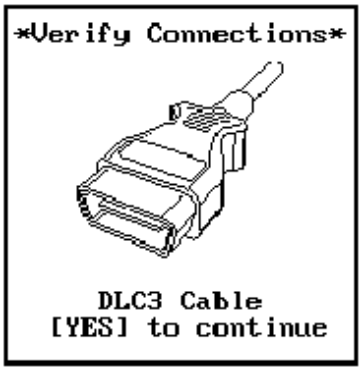


44.0 EV (ELECTRIC VEHICLE)

The M-OBD EV system provides enhanced diagnostic functions and procedures. The M-OBD EV system is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, DTC Info, Active Test, and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
① - ④	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.



45.0 BATTERY

The M-OBD Battery system (for electric vehicles) provides enhanced diagnostic functions and procedures. The M-OBD Battery system is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, DTC Info, Active Test, and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
(1) - (5)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.

PARAMETER MAINTENANCE

The Parameter Maintenance function is used to change the values of the Battery system, such as the battery capacity.

<BATTERY EXCHANGE>	Change the battery capacity after exchanging the battery pack.
<SOC CORRECT>	Change the SOC value after battery charging or discharging.
<ECU EXCHANGE>	Copy the current cumulative value to the new ECU when changing the battery ECU.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
(1) - (3)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.

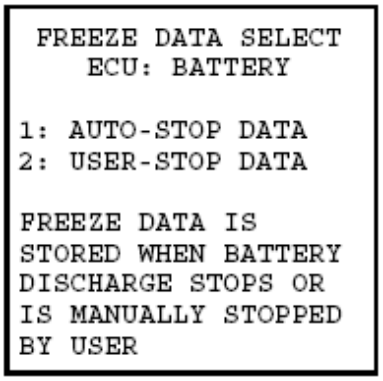
BATTERY DISCHARGE

The Battery Discharge function is used to discharge the battery module.

<DISCHARGE START> Start the battery discharge.
<DISCHARG INTERRPT> Interrupt the battery discharge.

ACTIVE KEYS

△ ▽ Change to next/previous menu item.
① - ② Select menu item.
ENTER Select highlighted menu item.
EXIT Return to the previous menu.



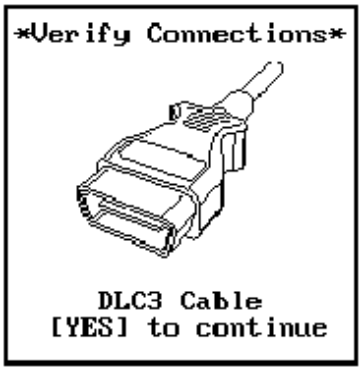
DISCHARGE FREEZE

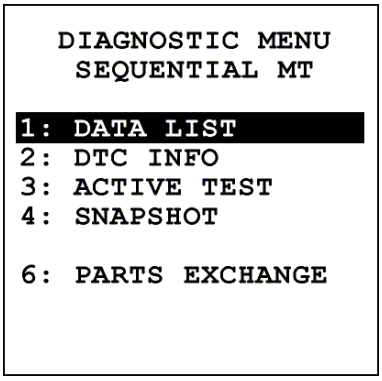
The Discharge Freeze function is used to display the freeze data for the battery module voltage.

<AUTO-STOP DATA> Display the battery module voltage after automatically stopping the battery discharge.
<USER-STOP DATA> Display the battery module voltage after stopping the battery discharge by the user.

ACTIVE KEYS

△ ▽ Change to next/previous menu item.
① - ② Select menu item.
ENTER Select highlighted menu item.
EXIT Return to the previous menu.





46.0 SEQUENTIAL MT

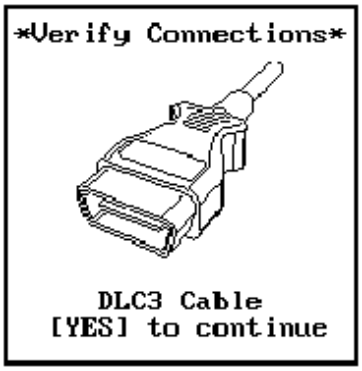
The M-OBD Sequential MT system provides enhanced Diagnostic functions and procedures. The M-OBD Sequential MT system is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, DTC Info, Active Test, and Snapshot Functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
(1) - (4), (6)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to previous menu.

PARTS EXCHANGE

This function rewrites data in the ECU once vehicle parts have been replaced. Refer to the service manual before performing any of these procedures.

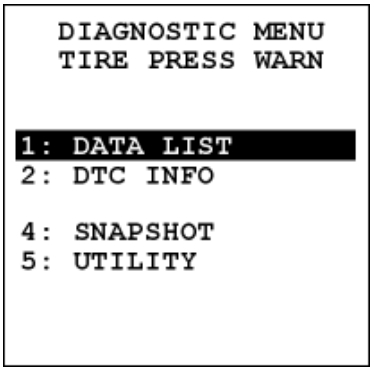


47.0 TIRE PRESSURE WARNING SYSTEM

The M-OBD Tire Pressure Warning system provides enhanced Diagnostic functions and procedures. The M-OBD Tire Pressure Warning system is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, DTC Info, and Snapshot please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
(1), (2), (4), (5)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to previous menu.



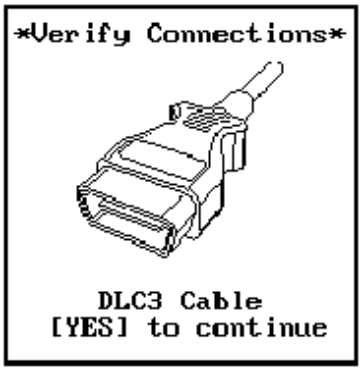
UTILITY

The Utility system monitors tire pressure and warns the driver when the pressure is not a proper value. Refer to the Service Manual before performing this procedure.

The following procedure is available:
<REGIST TIRE SET> Registers a new tire set with the ECU.

ACTIVE KEYS

(1)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to previous menu.



48.0 RTRCTBL HARDTOP

The M-OBD Retractable Hardtop system provides enhanced diagnostic functions and procedures. The M-OBD Retractable Hardtop system is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, DTC Info, and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
(1), (2), (4)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.

49.0 EMS (ELECTRONIC MODULATED SUSPENSION)

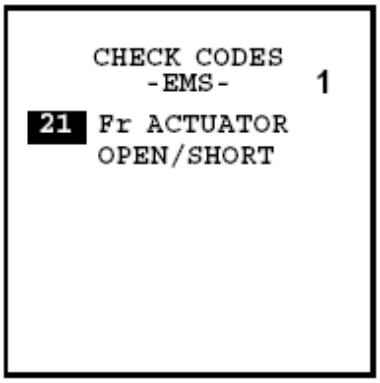
Toyota vehicles support two different types of diagnosis of the EMS system:

- OBD DTC Info only
- Multiplex-OBD (M-OBD)

The diagnostic functions available vary between the different ECU types. The connector used for diagnosis can provide a clue as to the type of ECU the vehicle has.

- OBD ECUs are diagnosed using either the CHECK or TDCL.
- M-OBD ECUs are diagnosed using the DLC3.

The diagnostic functions available are different for each of the systems. The diagnostic test modes are described separately. See Section 49.1: OBD EMS CODES and Section 49.2: M-OBD EMS.



49.1 OBD EMS CODES

The EMS function allows you to view the current state of the EMS system.

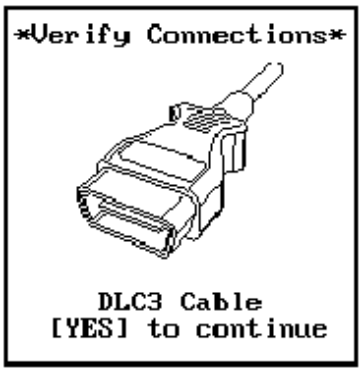
Until the first EMS code is received, the Tester displays "Waiting for Codes". If the EMS system does not contain any codes, the Tester displays "No Codes Present".

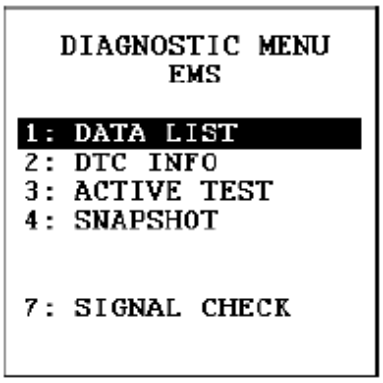
As new codes are received, they are displayed on the Tester. The Tester display continually updates to show all of the current EMS codes; use △ and ▽ to view all of the codes.

NOTE	The EMS codes transfer rate is very slow. Please wait a sufficient amount of time to ensure all codes have been read by the Tester.

ACTIVE KEYS

△ ▽ Scroll EMS codes.
EXIT Return to the <OBD MENU>.





49.2 M-OBD EMS

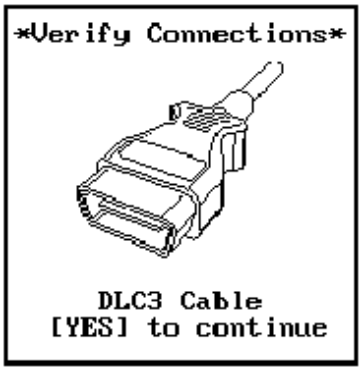
The M-OBD EMS system provides enhanced diagnostic functions and procedures. The M-OBD EMS system is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, DTC Info, Active Test, and Snapshot functions, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽ Change to next/previous menu item.
① - ④, ⑦ Select menu item.
ENTER Select highlighted menu item.
EXIT Return to the previous menu.

SIGNAL CHECK

Press ⑦ to select <SIGNAL CHECK> from the <DIAGNOSTIC MENU>. The SIGNAL CHECK function is used to verify that the ECU is receiving signals. Refer to the service manual before performing this function.

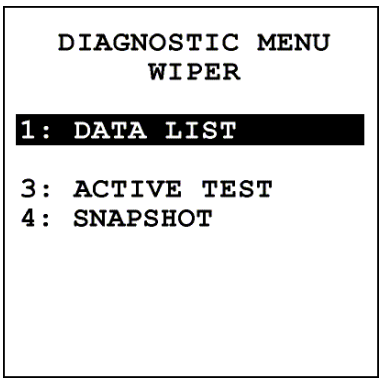


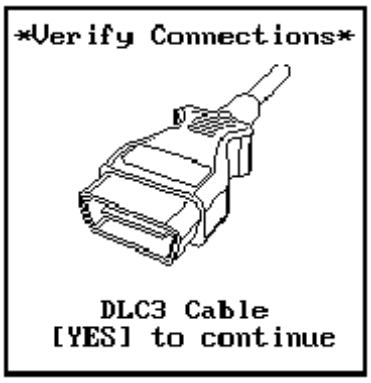
50.0 WIPER

The M-OBD Wiper system provides enhanced diagnostic functions and procedures. The M-OBD Wiper system is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List, Active Test, and Snapshot Info, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
(1), (3), (4)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to the previous menu.



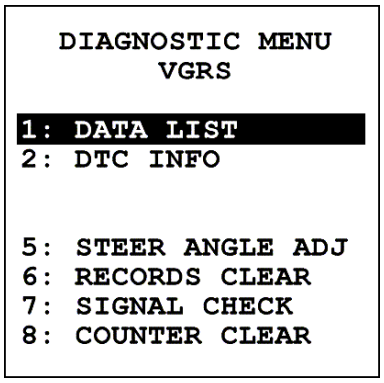


51.0 VGRS (VARIABLE GEAR RATIO STEERING)

The M-OBD VGRS system provides enhanced diagnostic functions and procedures. The M-OBD VGRS system is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List and DTC Info, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
①, ②, ⑤ - ⑧	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to previous menu.



STEERING ANGLE ADJUST

Press ⑤ to select <STEER ANGLE ADJ> from the <DIAGNOSTIC MENU>. The STEER ANGLE ADJUST function is used to adjust the steering angle and to register the neutral point of actuate angle to the ECU. Refer to the service manual before performing this function.

RECORDS CLEARANCE

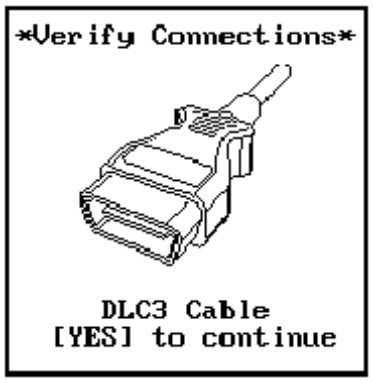
Press ⑥ to select <RECORDS CLEAR> from the <DIAGNOSTIC MENU>. The RECORDS CLEAR function is used to reset fault records back to UNREC. Refer to the service manual before performing this function.

SIGNAL CHECK

Press ⑦ to select <SIGNAL CHECK> from the <DIAGNOSTIC MENU>. The SIGNAL CHECK function allows the technician to perform certain VGRS diagnostic procedures without making terminal-to-terminal connections on the data link connector. Refer to the service manual before performing this function.

COUNTER CLEAR

Press ⑧ to select <COUNTER CLEAR> from the <DIAGNOSTIC MENU>. The COUNTER CLEAR function is used to clear DTC C1555 and reset the internal ECU counter. During this procedure, all codes stored in the ECU are also erased. Refer to the service manual before performing this function.

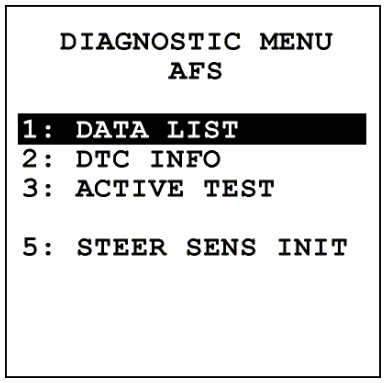


52.0 AFS (ADAPTIVE FRONT-LIGHTING SYSTEM)

The M-OBD AFS system provides enhanced diagnostic functions and procedures. The M-OBD AFS system is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List and DTC Info, please refer to Section 4.0: M-OBD Functions.

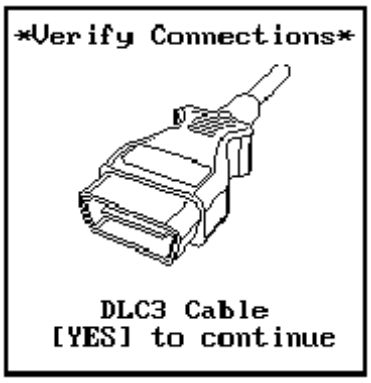
ACTIVE KEYS

△ ▽	Change to next/previous menu item.
(1) - (3), (5)	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to previous menu.



STEER SENS INIT

Press (5) to select <STEER SENS INIT> from the <DIAGNOSTIC MENU>. The Steering Sensor Initialize function is used to initialize the Steering Sensor after the battery has been disconnected, steering sensor has been replaced or the AFS ECU has been replaced. Refer to the service manual before performing this function.

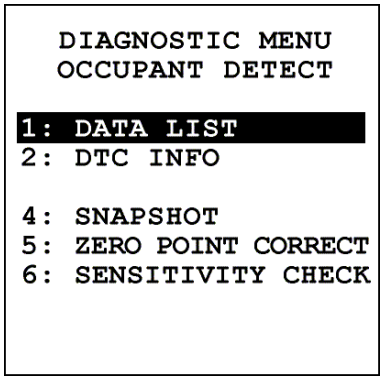


53.0 OCCUPANT DETECT

The M-OBD Occupant Detect system provides enhanced diagnostic functions and procedures. The M-OBD Occupant Detect system is diagnosed using the Tester connected to DLC3. Please verify the correct vehicle connection. For Operating Procedures for the Data List and DTC Info, please refer to Section 4.0: M-OBD Functions.

ACTIVE KEYS

△ ▽	Change to next/previous menu item.
①, ②, ④ - ⑥	Select menu item.
ENTER	Select highlighted menu item.
EXIT	Return to previous menu.

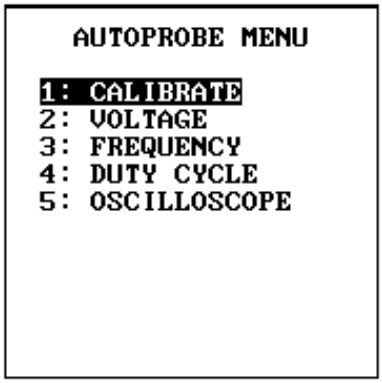


ZERO POINT CORRECT

Press ⑤ to select <ZERO POINT CORRECT> from the <DIAGNOSTIC MENU>. The Zero Point Correct function is used to reset the Occupant Detect system after servicing. Refer to the service manual before performing this function.

SENSITIVITY CHECK

Press ⑥ to select <SENSITIVITY CHECK> from the <DIAGNOSTIC MENU>. The Sensitivity Check function is used to check the accuracy of the Occupant Seat Sensor. Refer to the service manual before performing this function.



54.0 AUTOPROBE

HINT	For more accurate readings, it is recommended that the Tester be powered directly by the battery with the Battery Adapter Cable and that a calibration be performed before measuring voltage and using the oscilloscope.

Press (4) to select <AUTOPROBE> from the <MAIN MENU>. The <AUTOPROBE MENU> allows you to calibrate the Autoprobe, use the Autoprobe to measure voltage and frequency, or use the Autoprobe in conjunction with the Oscilloscope function.

ACTIVE KEYS

△ ▽ Change highlighted menu item.
(1) - (5) Select menu item.
(ENTER) Select highlighted menu item.

CALIBRATE

Press (1) to select <CALIBRATE> from the <AUTOPROBE MENU>. Place the Autoprobe tip on the recommended reference point (battery negative terminal or other vehicle ground), then press and hold the switch on the Autoprobe.

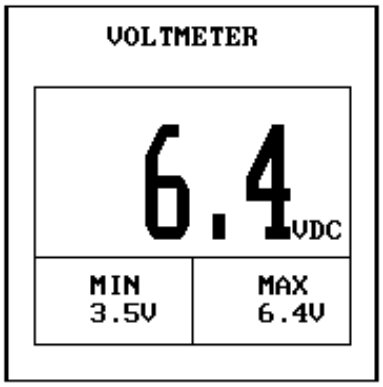
ACTIVE KEYS

(EXIT) Return to the <AUTOPROBE MENU> without calibrating Autoprobe.

The display at the left informs you that the calibration is complete. The probe tip may be removed from the reference point. Press (EXIT) to return to the <AUTOPROBE MENU>.

ACTIVE KEYS

(EXIT) Return to the <AUTOPROBE MENU>.



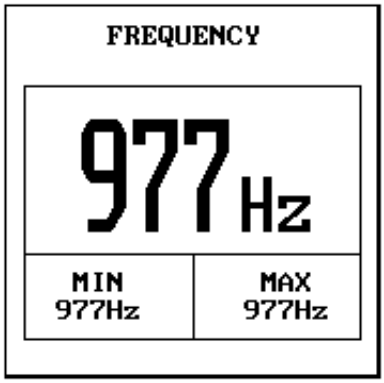
VOLTAGE

Press (2) to select <VOLTAGE> from the <AUTOPROBE MENU>. The Voltage mode allows you to use the Autoprobe as a volt meter.

Measurement voltage is frozen by pressing the switch on the Autoprobe. Pressing the switch again displays normal voltage.

ACTIVE KEYS

(ENTER) Reset the Maximum and Minimum values to 0.0V.
(EXIT) Return to the <AUTOPROBE MENU>.



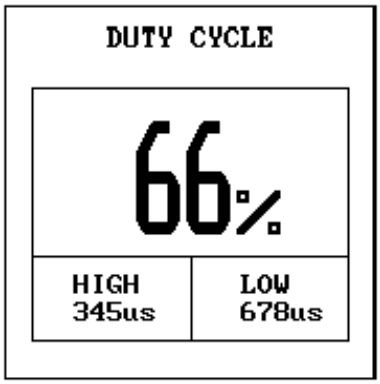
FREQUENCY

Press (3) to select <FREQUENCY> from the <AUTOPROBE MENU>. The Frequency mode allows you to use the Autoprobe as a frequency counter.

Measurement frequency is frozen by pressing the switch on the Autoprobe. Pressing the switch again displays normal frequency.

ACTIVE KEYS

(EXIT) Return to the <AUTOPROBE MENU>.
(ENTER) Resets the Maximum and Minimum values.



DUTY CYCLE

Press (4) to select <DUTY CYCLE> from the <AUTOPROBE MENU>. The Duty Cycle mode measures the widths of the high and low signals and displays this value as a percentage.

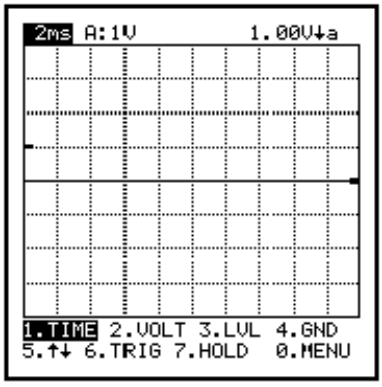
The <HIGH> value indicates the longest amount of time that the signal was in the <HIGH> state. The <LOW> value indicates the longest amount of time the signal was in the <LOW> state. The Duty Cycle value indicates the percentage of time the signal was in the <LOW> state.

Measurement duty cycle is frozen by pressing the switch on the Autoprobe. Pressing the switch again displays normal duty cycle.

ACTIVE KEYS

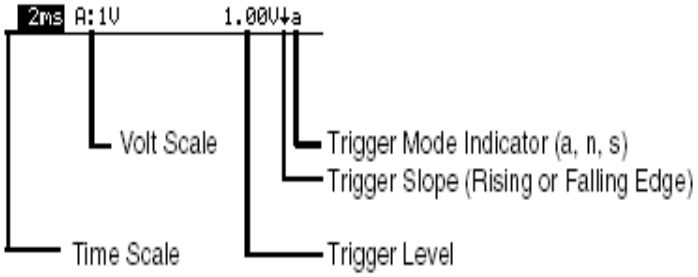
(ENTER) Reset Minimum\Maximum, High\Low values.
(F1) Switch between Minimum\Maximum and High\Low display.
(EXIT) Return to the <AUTOPROBE MENU>.

OSCILLOSCOPE



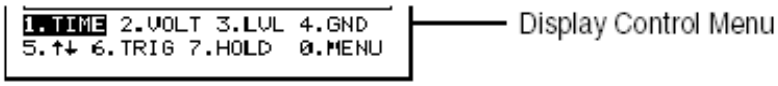
Press (5) to select <OSCILLOSCOPE> from the <AUTOPROBE MENU>. The Oscilloscope mode displays voltage signals from the Autoprobe for real-time analysis.

The status line at the top of the display indicates the current settings for the Oscilloscope display.



DISPLAY CONTROL

The Oscilloscope Mode display configuration may be adjusted to display the data in different formats. The Display Control menu at the bottom indicates keys that are used to change the Oscilloscope settings. The △ and ▽ keys are used to change the highlighted setting. To adjust a different setting, press the key which corresponds with the number to the left of the setting to be changed.



1. TIME	Use △ and ▽ to change the Time Scale. The supported time per division scaling is: .2ms, .5ms, 1ms, 2ms, 5ms, 10ms, 20ms, 50ms, 0.1s, 1s, 2s, 5s, 10s, 20s, 50s.
2. VOLT	Use △ and ▽ to change the Volt Scale. The supported volts per division scaling is: 0.1V, 0.2V, 0.5V, 1V, 2V, 5V.
3. LVL	Use △ and ▽ to make coarse adjustments to the trigger level. Trigger level is set in 1/2 division increments. Use ✱△ and ✱▽ to make fine adjustments to the trigger level.
4. GND	Use △ and ▽ to change the GND level. The trigger level indicator moves along with the GND level.

TRIGGER CONTROL

5. ↓↑ — Toggles the trigger slope (rising or falling). The current trigger slope is indicated on the top right of the display.
↑= trigger on rising edge
↓= trigger on falling edge

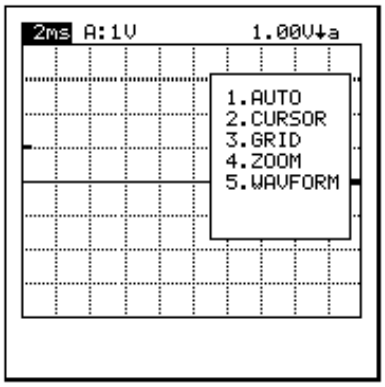
6. TRIG — There are three Trigger Modes: NORMAL, AUTO, and SINGLE SHOT. Pressing (6) cycles through the three modes.

In NORMAL mode (the default mode), the Tester waits for the trigger to occur before the waveform is displayed. Normal mode is indicated by a "n" in the upper right corner of the display.

In AUTO mode, if a trigger does not occur for 250 ms, a trigger is forced to occur. This allows signals to be found more easily since the display shows the waveform even when a trigger does not occur. Auto mode is indicated by an "a" in the upper right corner of the display.

In SINGLE SHOT mode, the trigger is only activated when the signal crosses the trigger level, or the (ENTER) key is pressed. While waiting for the trigger the single shot indicator shows an upper case "S". When a trigger occurs, the indicator changes to a lower case "s". The display remains frozen until the (ENTER) key is pressed, or a new trigger mode is chosen.

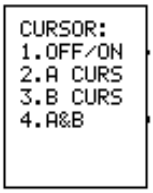
7. HOLD — The HOLD mode freezes the current display so that the waveform can be analyzed. The display is frozen until the (7) key is pressed again, the trigger mode is changed, or the display is adjusted (time scale or scale changed). When the hold mode is active, the right Red LED is turned on.



POP-UP MENU FUNCTIONS

When 0.MENU is selected, a menu pops up on the screen. This menu allows selection of additional display controls and Time Axis modes. The additional functions available are: Auto Setup, Cursor, Grid Display, Zoom, Waveform Save, and Recall.

1. AUTO — The Tester automatically sets the Time Scale, Volt Scale, and Trigger Level based on the signal measured. This allows the signal to be easily found on the screen. After AUTO setup is performed, further manual adjustments may be made to configure displayed waveforms in the most useful format.



2. CURSOR — When 2.CURSOR is selected, the pop-up menu changes to the Cursor Control menu. Press the key to the left of the cursor selection to change the setting.

There are two cursors: A and B. The A cursor is represented by a solid line, the B cursor is represented by a dotted line. Cursors can be moved with the left and right arrow keys (faster movement can be achieved by pressing ✱ ◁ and ✱ ▷). To move the B cursor to the A position press the YES key.

When the cursor is turned on, a three or four line window appears in the bottom right part of the screen as follows:

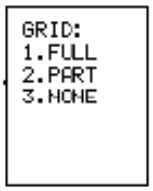
XXXXV - Voltage Value at the A (solid) cursor position

X.X ms - Time difference of A and B cursor position

XXXXHz - Computed frequency for above

ACTIVE KEYS

1 Turn cursor off or on.
2 Control A (solid) cursor.
3 Control B (dotted) cursor.
4 Control A and B cursors together.
EXIT Return to previous menu.



3. GRID

When 3.GRID is selected, the pop-up menu changes to the Grid Control menu. Press the key to the left of the grid selection to change the grid display.

ACTIVE KEYS

(1)	Full grid.
(2)	Partial grid.
(3)	No grid is displayed.
(EXIT)	Return to previous menu.

4. ZOOM

When 4.ZOOM is selected and the cursor is turned on, the display resolution is changed to place the section of the waveform between the cursors to a full screen. This function is only available when the HOLD mode is active.

NOTE	The maximum zoom is to the 0.2 ms/div range.

For example, if a waveform viewed at 10 ms/Div is frozen using the HOLD function and the cursors are used to Zoom in on a particular section, the first time Zoom is selected the Time Scale would change to 5 ms/Div (2x); and the second time Zoom is selected the Time Scale would change to 2 ms/Div (5x).

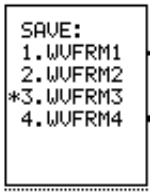
ACTIVE KEYS

(4)	Zoom display.
(EXIT)	Return to previous menu.

5. WAVEFORM When 5.WAVEFORM is selected the pop-up menu changes to allow you to save a waveform, recall a previously saved waveform, or delete a saved waveform.

ACTIVE KEYS

(1) - (3) Select menu item.
(EXIT) Return to previous menu.



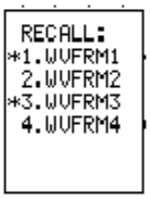
1.SAVE When 1.SAVE is selected, the pop-up menu displays the available save waveform slots. Up to four waveforms can be saved. Press the number of the slot to save the current waveform.

HINT	Use the HOLD Function to freeze the display before saving. This way you are sure of the waveform that is saved.

An "*" appears next to the slots that have waveforms previously saved. To overwrite a saved waveform, select the slot with an "*".

ACTIVE KEYS

(1) - (4) Save Waveform.
(EXIT) Return to previous menu.



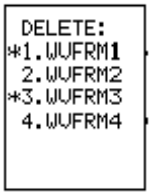
2.RECALL When 2.RECALL is selected, the pop-up menu displays the available save waveform slots. Up to four waveforms can be saved. An "*" indicates a waveform has been saved in the slot. Select the waveform to recall (1-4).

ACTIVE KEYS

(1) - (4) Recall Waveform.
(EXIT) Return to previous menu.

When a waveform is selected for Recall, the display changes to show the waveform. A limited number of functions are available during waveform recall: CURSOR, GRID, ZOOM, and WAVEFORM. All other normal functions of the Oscilloscope are disabled during Waveform Recall.

When you are finished reviewing the waveform, press the (YES) key to return to continuous sampling of the input channels.



3.DELETE When 3.DELETE is selected, the pop-up menu changes to allow deletion of a saved waveform. An "*" indicates that a waveform has been saved in the corresponding slot. Select the waveform to delete (1-4). The deleted waveform is longer be available for recall.

ACTIVE KEYS

(1) - (4) Delete Waveform.
(EXIT) Return to previous menu.

55.0 O2S/RPM CHECK

Press (7) to select <O2S/RPM CHECK> from the <FUNCTION SELECT> menu. The O2S/RPM Check function provides a way to view the oxygen sensor voltages on a line graph and to monitor the engine RPM.

The O2S/RPM function uses either DLC1 (CHECK) or DLC3 (OBD-II connector). In order to diagnose all of the O2 Sensors available on the vehicle, use the DLC3 when available.

ACTIVE KEYS

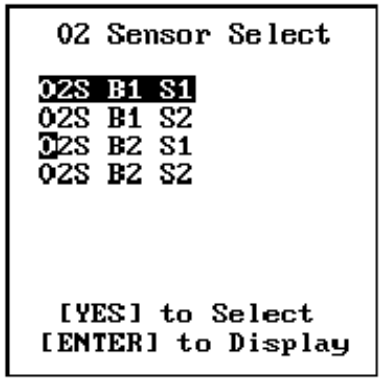
△ ▽ Move highlight up/down.
(ENTER) Select highlighted menu item.
(1) - (2) Select menu item.

DLC1 DIAGNOSIS

Select the O2 Sensors to view and the number of the cylinder on the engine. The O2 Sensor voltage and engine RPM are measured by the Tester directly from the DLC1.

ACTIVE KEYS

◁ ▷ Select either the O2 sensor or the number of cylinders.
△ ▽ Change the O2 sensor or number of cylinders selection.
(ENTER) Confirm the selections and continue with the test.

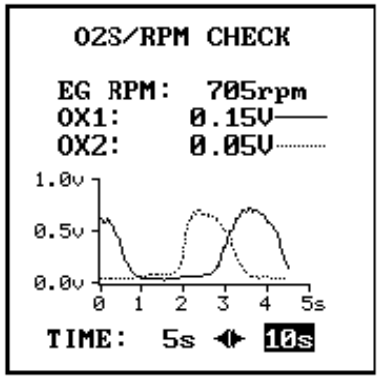


DLC3 DIAGNOSIS

Select the O2 Sensors to view. Up to two sensors may be selected. The Sensor voltages and engine RPM are transmitted by the ECU to the Tester.

ACTIVE KEYS

△ ▽ Move cursor up/down.
(YES) Select sensor.
(NO) Deselect sensor.
(ENTER) Confirm selections and continue with test.



The O2S/RPM screen displays the O2 sensor voltages in an analog waveform chart and engine RPM.

ACTIVE KEYS

◁ ▷ Toggle the time scale between 5 seconds and 10 seconds.
(ENTER) Toggle the display between Hold mode and Real Time mode.
(EXIT) Return to the <FUNCTION SELECT> menu.

56.0 SNAPSHOT REVIEW

Press (8) to select <SNAPSHOT REVIEW> from the <FUNCTION SELECT> Menu. The Snapshot Review function allows replay of saved snapshots when the Tester is not connected to a vehicle.

<OBD>	OBD Engine Snapshots.
<MOBD>	All M-OBD Body and Chassis Snapshots.
<ENHANCED OBD II>	Enhanced OBD II Engine Snapshots.
<CARB OBD II>	CARB OBD II Engine Snapshots.
<BREAK-OUT BOX>	Break-Out Box Snapshots.
<NVH>	NVH Snapshots.
<FUEL CONSUMPTION>	All Fuel Consumption Snapshots saved through OBD, Enhanced OBD II or Break-Out Box.
<GAS ANALYSIS>	Gas Analyzer Snapshots (Gas Only and Gas/Vehicle).

ACTIVE KEYS

△ ▽	Change highlighted menu item.
(1) - (8)	Select menu item.
(ENTER)	Select highlighted menu item.

REPLAY SNAPSHOT

When a menu item is selected, a list of the available snapshots is displayed. Snapshot Event Replay options are listed below:

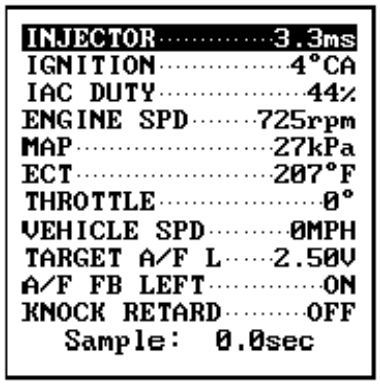
ACTIVE KEYS

△ ▽	Move the cursor (highlight) up and down.
(ENTER)	Display the vehicle information of the selected snapshot data.
(✱)(ENTER)	Delete selected snapshot from the list.

The vehicle information of the selected snapshot data is displayed.

ACTIVE KEY

(ENTER)	Display selected snapshot data.



DATA DISPLAY

The data parameters which were captured during the event are displayed. The current Snapshot frame is indicated by <Sample> and a time stamp.

ACTIVE KEYS

◁ ▷ Sequence through the sample displayed.

△ ▽ Move the display up or down one parameter.

✱ △ Move the display one page. (<DATA LIST> mode only.)

✱ ▽

YES Change the highlighted parameter to the next parameter in the list. (<LED/LIST>, <BAR GRAPH>, and <LINE GRAPH> modes only.)

NO Change the highlighted parameter to the previous parameter in the list. (<LED/LIST>, <BAR GRAPH>, and <LINE GRAPH> modes only.)

✱ YES Change to next page of parameters. (<LED/LIST>, <BAR GRAPH>, and <LINE GRAPH> modes only.)

✱ NO Change to previous page of parameters. (<LED/LIST>, <BAR GRAPH>, and <LINE GRAPH> modes only.)

F1 Go to <DATA LIST> mode.

F2 Go to <LED/LIST> mode.

F3 Go to <BAR GRAPH> mode.

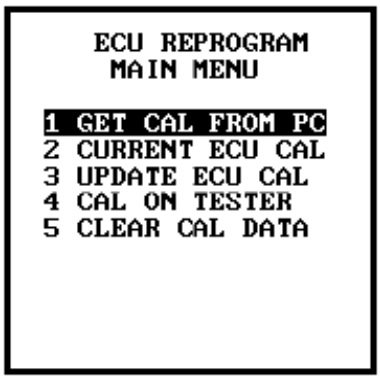
F4 Go to <LINE GRAPH> mode.

F9 Change between large and compressed character size.

F0 Turn cursor on and off.

✱ HELP Display parameter information.

SEND Print the current Snapshot sample.



57.0 ECU REPROGRAMMING

The ECU REPROGRAMMING application allows authorized service professionals to update ECU software without removing the ECU. Please note that there are many security checks performed by the ECU during the reprogamming process, so the specified reprogramming procedure must be followed carefully.

CAUTION!

CAUTION

DO NOT attempt ECU reprogramming without proper training from the Toyota service division.

MAIN MENU

The <ECU REPROGRAM> Main Menu provides access to all reprogramming functions. These functions are fully described in Toyota service training documents; a brief description may be found below:

<1: GET CAL FROM PC>	Used to transfer calibration files from a PC to the TDT.
<2: CURRENT ECU CAL>	Used to read the current calibration data on the vehicle.
<3: UPDATE ECU CAL>	Used to transfer a new calibration file from the TDT to the vehicle.
<4: CAL ON TESTER>	Used to review calibration files stored on the TDT.
<5: CLEAR CAL DATA>	Used to delete one or all calibration files stored on the TDT.

ACTIVE KEYS

△ ▽	Change highlighted menu item.
(1) - (5)	Select menu item.
(ENTER)	Select highlighted menu item.
(EXIT)	Return to the Power-up/vehicle make selection screen.

1.0 GETTING READY

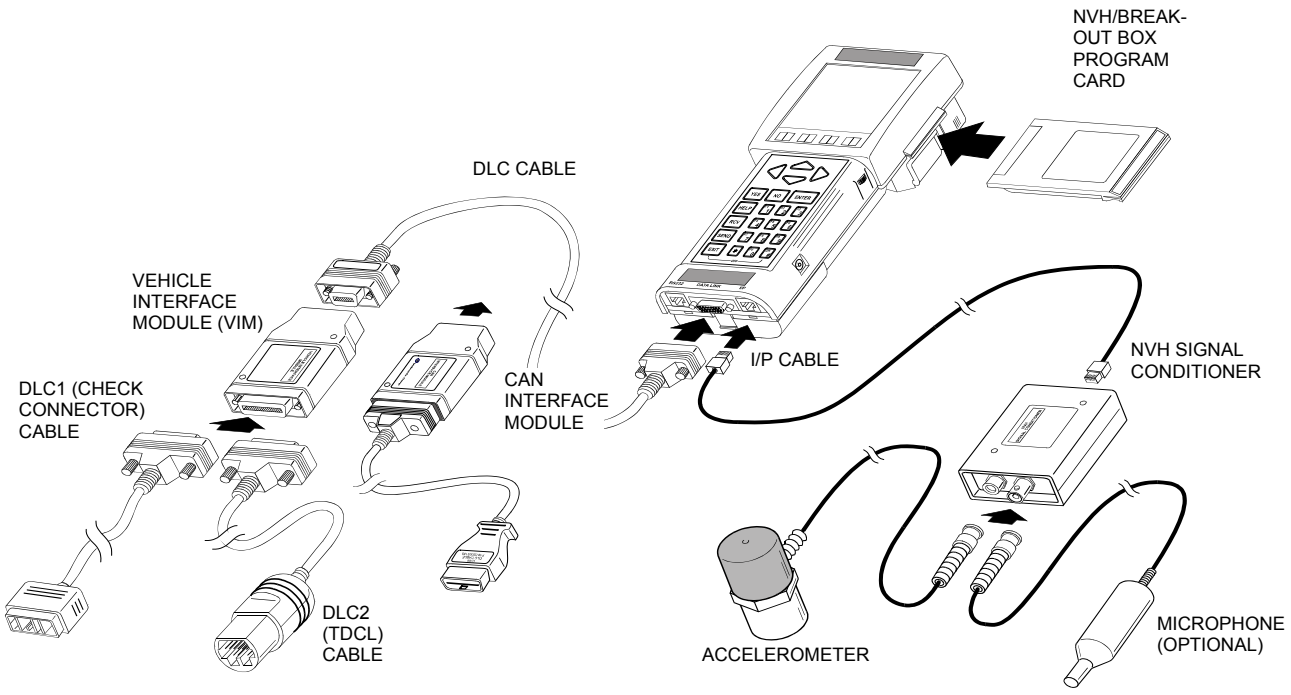
Before using the NVH Analyzer, the following steps must be taken:

1. Insert the Program Card into the Tester.
2. Connect the Tester to the vehicle as described in the Getting Started Section in the Tester Operator's Manual.
3. Connect one end of the I/P cable to the Instrumentation Port (I/P) at the bottom right corner of the Tester. The connector is keyed so it will only fit into the correct port. Connect the other end of the I/P cable to the I/P port on the Signal Conditioner box.
4. Connect the accelerometer or the optional microphone to the BNC connector on the end of the Signal Conditioner module.
5. Power up the Tester as described in the Getting Started Section in the Tester Operator's Manual.

CAUTION!

For safety reasons, two technicians are required when test driving with the NVH Analyzer: one to drive the car while the other operates the NVH Analyzer.

NVH ANALYZER SETUP



2.0 FUNCTION AND VEHICLE SELECTION

When the Tester is powered up with the Program Card installed, you must confirm and/or enter information about the program card and about the vehicle being tested. The information includes the vehicle make, year, body type, and engine type.

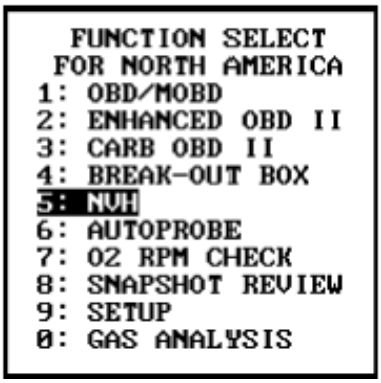
POWER-UP

The program card identification screen is displayed when the Tester is powered up. Press (ENTER) to continue.

ACTIVE KEY

(ENTER) Proceed to the <FUNCTION SELECT> menu.

SELECTING A FUNCTION



All functions present in the Program Card are displayed. Refer to the following sections for operating instructions:

<1: OBD/MOBD>	OBD Operator's Manual
<2: ENHANCED OBD II>	OBD II Operator's Manual
<3: CARB OBD II>	OBD II Operator's Manual
<4: BREAK-OUT BOX>	Break-out Box Operator's Manual
<5: NVH>	See *NVH Main Menu on page 202* through *Data Record on page 212* of the manual.
<6: AUTOPROBE>	OBD Operator's Manual, Autoprobe section
<7: O2 RPM CHECK>	OBD Operator's Manual,O2S/RPM Check section
<8: SNAPSHOT REVIEW>	OBD Operator's Manual, Snapshot Review section
<9: SETUP>	Tester Operator's Manual,Using the Setup Mode section
<0: GAS ANALYSIS>	Gas Analyzer Operator's Manual, (USA only).

ACTIVE KEYS

△ ▽	Change highlighted menu item.
(1) - (0)	Select menu item.
(ENTER)	Select highlighted menu item.
(EXIT)	Return to the Power-up display.

BRAND SELECTION

When <OBD/MOBD>, <BREAK-OUT BOX>, or <NVH> is selected from the <FUNCTION SELECT> menu, the <BRAND SELECTION> menu is displayed only if a vehicle brand has not previously been selected.

To change the vehicle brand, refer to Using the Setup Mode section in the Tester Operator's Manual.

SELECTING THE VEHICLE

This screen is only displayed if a vehicle has previously been selected.

From the <VEHICLE SELECT> menu you can select a new vehicle to test or select the last vehicle that was tested. Use the up and down keys to select <NEW VEHICLE> or <LAST VEHICLE>, then press (ENTER).

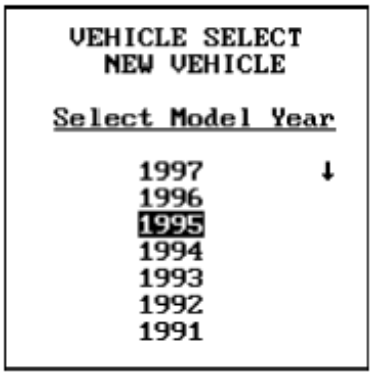
NEW VEHICLE: Select a new vehicle from the vehicle select displays.

LAST VEHICLE: The selection criteria used to select the previous vehicle are displayed. Press (ENTER) to proceed to the NVH Menu.

ACTIVE KEYS

△▽ Move highlighted cursor between <NEW VEHICLE> or <LAST VEHICLE>.
(ENTER) Select the highlighted menu item: either new vehicle or last vehicle.
(EXIT) Return to <FUNCTION SELECT> menu.

NOTE	The term "VEHICLE" indicates the model and system. Select <NEW VEHICLE> in order to test systems different from the previous selection.



MODEL YEAR SELECT SCREEN

After selecting the model year, all body types available for the selected year are displayed. The ↓ indicates that there are more selections available than can be displayed on the screen. Use the △ and ▽ keys to select the type of vehicle you are testing, then press (ENTER) to continue.

ACTIVE KEYS

△ ▽ Move highlighted cursor between menu options.
(ENTER) Select vehicle type.
(EXIT) Return to New Vehicle/Last Vehicle screen.

MODEL SCREEN

After selecting the model year, all body types available for the selected year are displayed. Use the △ and ▽ keys to select the type of vehicle you are testing, then press (ENTER) to continue.

ACTIVE KEYS

△ ▽ Move highlighted cursor between menu options.
(✱)▽ Move the display one page.
(✱)△
(ENTER) Select vehicle type.
(EXIT) Return to Select Model Year screen.

VEHICLE SELECT SCREEN(S)

In some cases further vehicle identification is required. Up to four select screens may be displayed to select a particular vehicle. Use the up and down arrow keys to move the cursor between options, then press (ENTER) to select the option.

ACTIVE KEYS

△ ▽ Move highlighted cursor between options.
(ENTER) Select highlighted menu option.
(EXIT) Return to previous screen.

VEHICLE CONFIRMATION SCREEN

When all of the requested information has been entered, a summary screen of the vehicle configuration is displayed. If the information does not match the vehicle, press (EXIT) to review the previously displayed screens. Correct the information, then proceed through the vehicle selection process again. If the information matches the vehicle you are testing, press (YES) and the <NVH MENU> is displayed. The number in the right column is the unique vehicle reference number.

ACTIVE KEYS

(YES) Confirm systems selected.
(EXIT) Return to Vehicle Select displays.

SCREEN WITH AXLE RATIO HIGHLIGHTED

SCREEN WITH SPEED CODE HIGHTLIGHTED

SUMMARY AND VEHICLE PARAMETER SCREEN

When all requested vehicle identification information has been entered, a summary of the selected vehicle information and the vehicle parameters which are used in calculating the predicted vehicle vibrations are listed as follows:

Line 1
Line 2 Model Year and Model
Line 3 The vehicle Axle Ratio
Line 4 The vehicle Engine Type
Line 5 The number of balls in the CV Joint
Line 6 The vehicle Speed Code
This code is made by dividing the transmission Speedo driver gear by the Speedo drive gear.
Line 7 The source of vehicle data
OBD II: OBD II data parameters, use DLC3 (OBD II) connector cable.
TDCL: OBD data parameters, use TDCL cable. For this data you must use the cigarette lighter.
CHK: OBD data parameters, use Check Connector cable.
IG-: IG- pulse, use Check Connector cable.
HINT: To use IG- data you need to Enter gear. Automatic transmission vehicles must lockup the torque converter.
Line 9 The Drive Type of the vehicle being tested
FWD: Vehicle without driveshaft
RWD: Vehicle with driveshaft

In some cases the displayed Axle Ratio or Speed Code values may need to be changed. To change the values, use the up and down keys to highlight the figure to be changed. Use the left and right arrow keys to move the flashing cursor to the digit to be changed, then use the (0) - (9) keys to enter the new digit.

NOTE	The changed values revert to the original values stored in the program card when the NVH function is terminated.

CAUTION!	For safety reasons, two technicians are required when test driving with the NVH Analyzer: one to drive the car while the other operates the NVH Analyzer.

When all values match the vehicle being tested, press (ENTER) to continue to the <NVH MAIN MENU>.

If information other than Axle Ratio and Speed Codes does not match the vehicle being tested, press (EXIT) to make a revised vehicle selection.

ACTIVE KEYS

△ ▽ Select Axle Ratio or Speed code.
◁ ▷ Move selected digit left or right.
(0) - (9) Enter digit.
(ENTER) Confirm displayed axle ratio.
(EXIT) Return to vehicle selection displays without changing Axle Ratio or Speed Code values.

3.0 NVH MAIN MENU

In the <NVH MAIN MENU>, all functions available for the selected system are displayed. To select a function, press the key to the left of the function you wish to use. The use of each function is explained on the following pages.

ACTIVE KEYS

△ ▽ Move highlight up or down.
(ENTER) Select highlighted menu item.
(1) - (3) Select menu item.

LOSS OF COMMUNICATION

The screen at the left is displayed if the NVH Signal Conditioner module is not connected to the Tester when the Vibration or Noise function is selected from the <NVH MAIN MENU>, or if the module becomes detached while the NVH function is operating. Check that the I/P cable is connected to the Tester and Signal Conditioner module, then press (ENTER) to continue.

ACTIVE KEYS

(ENTER) Continue testing after connecting the Signal Conditioner module.
(EXIT) Quit the NVH function and return to the <NVH MAIN MENU>.

4.0 NVH DISPLAYS

When using the Vibration and Noise modes, the Tester offers a variety of ways to display real time and stored data. A brief description of each display mode is listed below. A complete description of operating each display mode is on the following pages.

TWO-DIMENSIONAL (2-D) SPECTRAL DISPLAY MODE

Frequency bands of 62.5 hz, 125 hz, 250 hz, and 500 hz are available for viewing real time spectral Vibration or Noise data. Vibration component identifiers for the engine, driveline, or wheel frequencies are displayed on the screen. A moveable cursor identifies the magnitude and frequency of the vibration that is present at the current cursor position.

THREE-DIMENSIONAL (3-D) BARCHART DISPLAY MODE

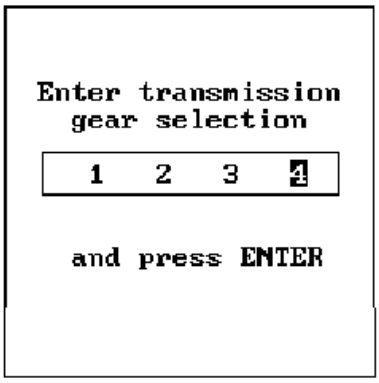
Vibration or Noise data are displayed in bars that reflect the engine, driveline, wheel, and total energy sampled. Eleven continuous cycles are displayed for analysis. The most recent is displayed at the bottom of the Barchart display. Frequency bands of 62.5 hz, 125 hz, 250 hz, and 500 hz are available for viewing real time spectral Vibration or Noise data.

THREE-DIMENSIONAL (3-D) RASTER DISPLAY MODE

Eleven cycles of Vibration or Noise data are displayed in a 3-D format. The most current cycle is located at the bottom of the 3-D display. Frequency bands of 62.5 hz, 125 hz, 250 hz, and 500 hz are available for viewing real time spectral Vibration or Noise data. Vibration component identifiers for the engine, driveline, or wheel frequencies are displayed on the screen.

PAUSE MODE

In the PAUSE mode you may cycle through the 2-D and 3-D display modes. In the 2-D and 3-D spectral displays, vibration component, identifiers for engine, driveline, and wheels are available. The amplitude range is also adjustable. Data can be saved in memory for review at a later time; stored data is retained even when the Tester is powered down.



CHANGE GEAR POSITION

If the selected vehicle does not have an OBD or OBD II data stream, the current gear position must be entered while performing a NVH test. The gear position is used to provide vehicle speed and certain rotational speeds which predict vibration frequencies. To isolate the cause of noise and vibration accurately when testing a vehicle with automatic transmission, be sure the transmission *torque converter is in the lockup state*.

Press (F8) while in any of the three display modes to change the gear position. Use the left and right keys to select a different gear position, then press (ENTER).

ACTIVE KEYS

△ ▽ Move cursor left or right
(ENTER) Select gear position.
(EXIT) Quit without changing the gear position.

SPECIAL DIAGNOSTIC CONDITIONS

PREDICTED VIBRATION FREQUENCY IS OUT OF RANGE

If a calculated vibration frequency for the engine, driveline, or wheels is predicted to be beyond the current frequency display range, the frequency range indicator in the upper right corner of the display and the letters <hz> flash at a 1 hertz rate.

On the Barchart display, a flashing <hz> located below the component identifier indicates which component is out of range.

For the 2-D and 3-D Spectral display modes the out of range condition can exist only for the selected component. For the Barchart display, an out of range condition may exist for any of the vibrational components.

OVERLAP CONDITION

If the calculated vibration frequencies for the engine, driveline, or wheels are predicted to be in close proximity to one another, an overlap condition exists. If this occurs, the word <OVERLAP> flashes on the lower right corner of the screen. The right LED flashes RED, and the component identifier for the overlapped frequency also flashes.

For the Barchart display, an up arrow (↑) is shown under the component bars related to the overlap condition.

VIBRATIONS RELATED TO CV JOINTS

In certain vehicles a vibrational frequency related to the CV joint is calculated and identified on the driveline selection by a " ^ ". All other vibrational identifiers are the up arrow (↑).

IDENTIFIERS DISPLAYED FOR EACH COMPONENT

Vibration and Noise related to the component calculated and identified are as follows:

a) Engine component
   Engine frequency order ratios are related to driveline as follows:
   - Inline 4: 1st, 2nd revolution (firing frequency is 2nd)
   - Inline 6: 1st, 3rd revolution
   - V6: 1st, 2nd, 3rd revolution
   - V8: 1st, 4th revolution

b) Driveline component
   Driveline frequency order ratios are related to drive type as follows:
   CV joint is identified as (^)
   - FWD: Which has 3 ball type CV joint:wheel 3rd revolution
     Which has 6 ball type CV joint:wheel 6th revolution
   - RWD: Propeller shaft 1st, 2nd revolution, Identifiers are (↑)
     Which has 3 ball type CV joint:wheel 3rd revolution
     Which has 6 ball type CV joint:wheel 6th revolution

c) Wheel component
   Wheel frequency order ratios are as follows:
   1st, 2nd, 3rd revolution

A-WEIGHTED MODE

The A-weighted mode is used in the noise function and reflects the sound perception of the human ear. The frequency response at lower frequencies is greatly attenuated. The left red LED is lighted when A-weighting is selected. (Requires optional microphone.)

NO DATA

<NO DATA> is displayed for the <RPM> and <MPH/KPH> if the NVH Analyzer cannot process vehicle data. When <NO DATA> is displayed, verify that all vehicle connections are secure prior to the vehicle selection process.

SCALING FACTOR FOR VIBRATION TESTING

The Scaling Factor is used to maximize the bar height in Barchart in relation to the available screen height. Default is set to 60 dBg which means that bars calculated to be 60 dBg or higher use the full available bar height. Vibration amplitudes less than 60 dBg are proportionally sized on the screen. The Scaling Factor has a range from 10 dBg to 120 dBg. Scaling Factor may be adjusted by pressing △ to increase bar height or ▽ to decrease bar height. The Scaling Factor cannot be changed while in the PAUSE mode.

CALCULATED SPEED

If an asterisk (*) is displayed between the <MPH/KPH> indicator and the actual displayed vehicle speed, vehicle speed has been calculated from certain vehicle parameters and could differ from current vehicle speedometer reading if:

- an incorrect gear has been selected.
- the transmission is not in lock up.

When RPM falls below 1600 RPM, vehicle speed is not displayed and component identifiers are turned off.

AVERAGE MODE

The default data processing mode of the system averages the previous 5 data samples and displays the result on the screen.

TWO-DIMENSIONAL (2-D) SPECTRAL DISPLAY MODE

AMPLITUDE RANGES FOR VIBRATION IN dBg

MIN	MAX
0	20
*10	30
15	35
20	40
25	45
30	50
35	55
40	60
Default	

AMPLITUDE RANGES FOR NOISE IN dB

MIN	MAX
43	75
*65	85
75	95
85	103
Default	

2-D Spectral Display mode is the default mode entered when <VIBRATION> or <NOISE> is selected from the <NVH MAIN MENU>.

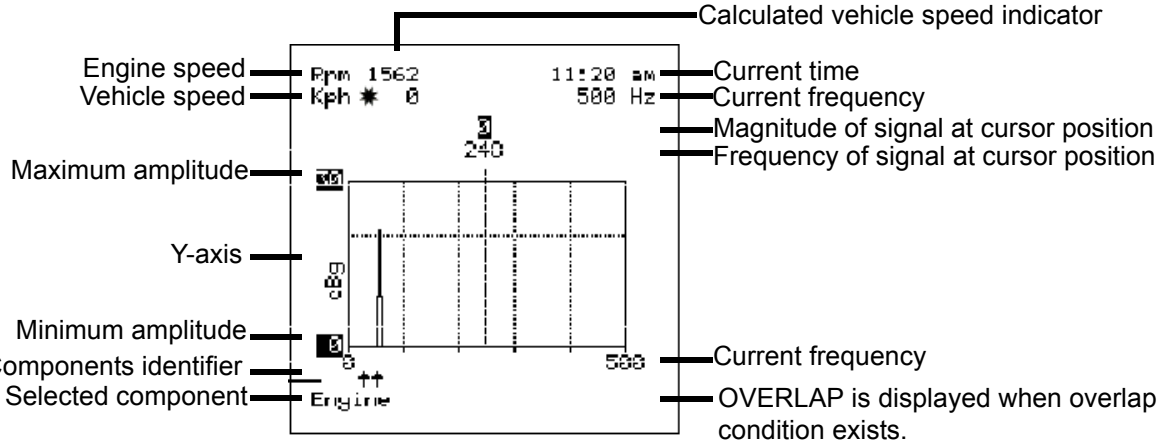
Frequency bands of 62.5 hz, 125 hz, 250 hz, and 500 hz are available for viewing real time Noise or Vibration data. The selected vibrational component with related component identifiers is displayed at the bottom of the screen.

The following information is displayed on the screen:

- Current time in the upper right corner.
- Selected frequency band below the time at the lower right corner of the chart.
- Engine speed in the upper left corner.
- Vehicle speed below engine speed.
- Y-axis identification on the left side of the chart (amplitude).
- Maximum amplitude in reverse video at the top left corner of the chart.
- The minimum amplitude in reverse video at the lower left corner of the chart.
- The selected vibration component in the lower left corner of the screen.
- Frequency of a selected signal at the cursor position.
- Magnitude of the selected signal in reverse video.
- Calculated vibration frequencies indicated by arrows at the bottom of the chart.

ACTIVE KEYS

◁ ▷	Move cursor left or right.
◁ ▷	Increase or decreases the amplitude range.
F0	Enter Pause mode.
F1	Change display to Barchart.
F2	Increase frequency band of display.
✷ F2	Decrease frequency band of display.
F3	Change selected component.
✷ F5	For Noise only, enters and exits A-weighted mode.
F8	Select gear position (vehicles with no data stream).
EXIT	Return to Main Menu.



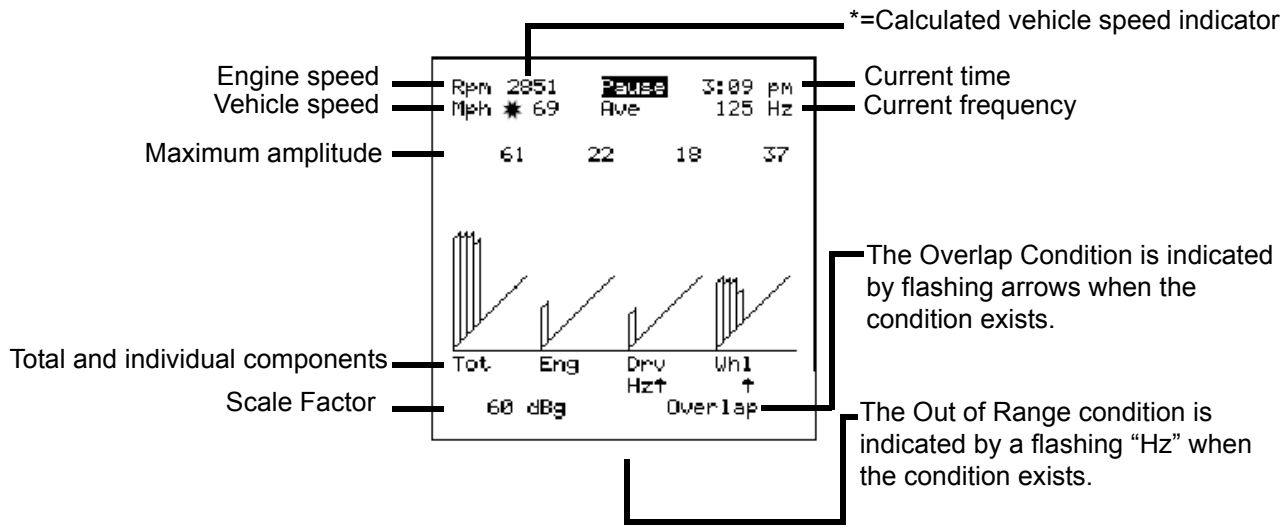
THREE-DIMENSIONAL (3-D) BARCHART DISPLAY MODE

Vibration energy present at vehicle component frequencies is added together to represent absolute vibration energy sampled. This data is presented in the form of a Barchart. The most recent 11 cycles of data are stored on the screen with the most current cycle located at the bottom of the screen.

ACTIVE KEYS

▲ ▼	Increase or decrease the scaling factor.
F0	Enter PAUSE mode.
F1	Change display to the Raster Chart.
F2	Increase frequency band of display.
✱ F2	Decrease frequency band of display.
✱ F5	For Noise only, enter and exit the A-weighted mode.
F8	Select gear position (for vehicles with no data stream).
EXIT	Return to Main Menu.

NOTE	The Barchart display reflects the state of vibration energy that is currently displayed on the 2-D display. The Amplitude range on the 2-D display can be increased to eliminate frequencies with low magnitudes. Only Spectral information present on the 2-D display is used to calculate the bars on the Barchart display.

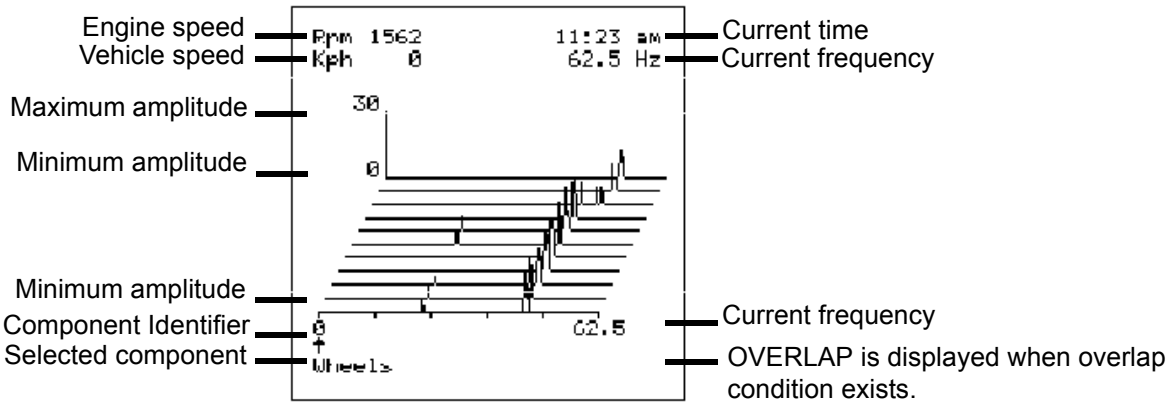


THREE-DIMENSIONAL (3-D) RASTER DISPLAY MODE

Eleven cycles of real time Noise or Vibration data are displayed in a 3-D format. The most current cycle is located at the bottom of the screen. The selected vibration component with related component identifiers, is located at the bottom of the screen.

ACTIVE KEYS

△ ▽	Increase or decrease amplitude range.
F0	Enter Pause mode.
F1	Change display to the 2-D mode.
F2	Increase frequency band of display.
✱ F2	Decrease frequency band of display.
F3	Change selected component.
✱ F5	For Noise only, enter and exit the A-weighted mode.
F8	Select gear position. (Vehicles with no data stream.)
EXIT	Return to Main Menu.



5.0 PAUSE MODE

Press (F0) to enter the PAUSE mode from any of the three display modes: 2-D, 3-D, or Barchart. When the PAUSE mode is active ,<Pause> is displayed in the top center of the screen. Frequency range cannot be changed while the PAUSE mode is active.

The PAUSE mode displays up to 11 cycles of real time data. Real time data acquisition is suspended. You may change display modes, amplitude range, cursor location, and vehicle components while viewing data captured in PAUSE mode. The flashing indicators for <OVERLAP> and frequency out of range is forced to the ON condition, if the conditions exist.

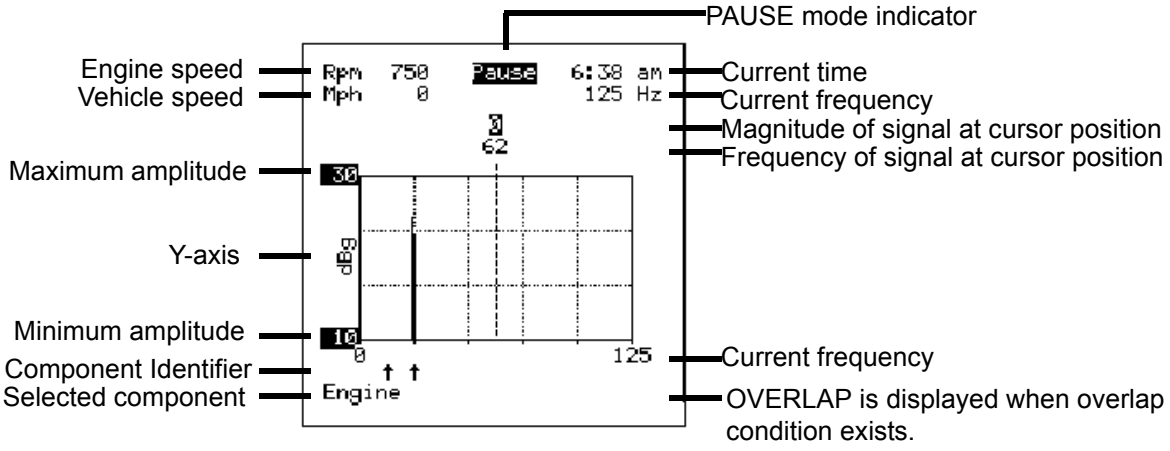
While in 3-D Raster display, stored spectral information may be scrolled one spectrum at a time by pressing △ or ▽. The spectrum at the bottom of the 3-D Raster screen is displayed when the 2-D display is selected. Only the spectrums on the 3-D Raster display are used in the Barchart display. A detailed example of using the PAUSE mode is provided on the following page.

From the PAUSE mode you can save data for later review. See Section *6.0 Data Record on page 212*.

Functions available in PAUSE mode are listed in the Active Keys descriptions.

ACTIVE KEYS

◁ ▷	Move cursor left or right (2-D mode only).
△ ▽	Increase or decrease amplitude range (2-D mode only). Scroll through stored spectral information (3-D Raster only).
(F0)	Exit PAUSE mode (all modes).
(F1)	Cycle through 2-D, 3-D, and Barchart display modes (all modes).
(F3)	Cycle through engine, wheel and drivetrain displays (all modes).
(F6)	Save current data block in Tester memory. If saved in the current pause cycle, this key is not active.



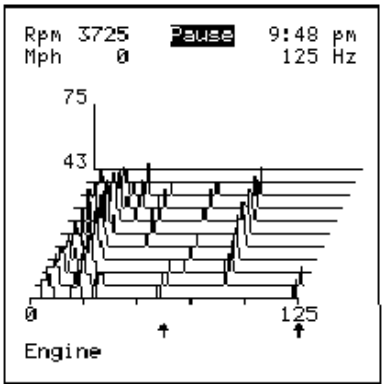


FIGURE 1 3-D Rastar Display
9th Recorded Cycle is Active

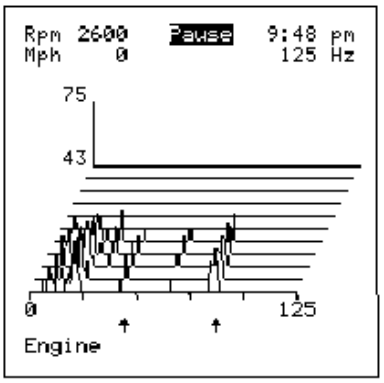


FIGURE 2 : 3-D Rastar Display
5th Recorded Cycle is Active

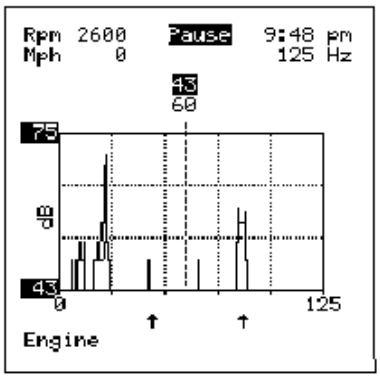


FIGURE 3 : 2-D Spectral Display
of 9th Recorded Cycle

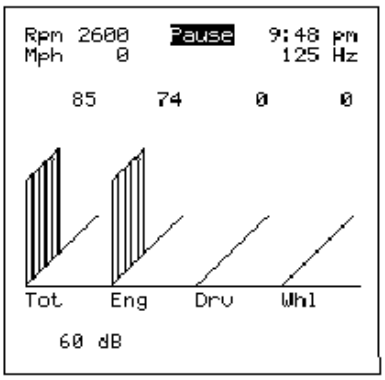


FIGURE 4 : 3-D Barchart
Display of 9th Recorded Cycle

EXAMPLE OF USING THE PAUSE mode

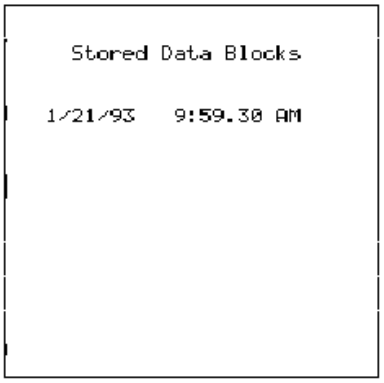
In Figure 1, nine cycles of vibration data have been recorded. Upon entering the Pause mode, the real time data collection and display are frozen. The 9th cycle of data is at the bottom of the display and is the active spectrum.

In Figure 2, the 3-D Raster display has been scrolled using the down key so that the fifth recorded cycle is at the bottom of the display. It is now the active spectrum. The up and down keys are active as long as data is available, if only one spectrum is displayed on the screen the down arrow key becomes inactive.

Pressing (F1) changes Figure 2 to Figure 3 (the 2-D spectral display) where details associated with the active spectrum (5th cycle) are displayed. In the 2-D display, the amplitude range may be adjusted to filter out spectral clutter

Pressing (F1) changes the display to Figure 4 (3-D Barchart). The determination of bar heights is based upon the default amplitude range. The data may be saved by pressing (F6). Pressing (F1) cycles back to the 3-D Raster display.

NOTE	Only the number of spectrums displayed in the 3-D Raster display are used to build the 3-D Barchart: If only one spectrum was visible on the 3-D Raster display, then only one set of bars would be displayed on the 3-D Raster display.



6.0 DATA RECORD

Press (F6) to enter the DATA RECORD MODE from the PAUSE mode.

If memory space is available, the current data block is automatically saved and given a "time stamp" (date and time) when PAUSE mode is first entered.

HINT	The NVH data is stored on the Program Card. Make sure that the same Program Card is used when reviewing stored NVH data.

If there is no memory space available when Data Record is selected, the time stamps of the stored data blocks are displayed in chronological order. To return to the PAUSE mode without saving the current data, press (EXIT). To store the current data block, you must first delete a stored data block and then try to save again.

Once the current pause data has been saved, the NVH system will not recognize the (F6) key. This prevents saving the same information twice.

ACTIVE KEYS

▽ △	Move the cursor up or down.
(ENTER)	Store data block.
(✱)(ENTER)	Delete a stored data block.
Any key	Return to the PAUSE mode.

7.0 REVIEW OLD DATA

STORED DATA BLOCKS

If <REVIEW OLD DATA> is selected, a chronological menu of stored data blocks is displayed. To view or delete a stored data block:

1. Use ▽ and △ to select the data you wish to view or delete.
2. Press (ENTER) to view the highlighted data block in PAUSE mode (Section *5.0 Pause Mode on page 210*), or press (✱)(ENTER) to delete the highlighted data block.
3. Select another data block to review or press (EXIT) to return to the <NVH MAIN MENU>.

ACTIVE KEYS

▽ △	Select the data you wish to review.
(ENTER)	Confirm selected data.
(EXIT)	Return to <NVH MAIN MENU>.
(✱)(ENTER)	Delete the highlighted data block.

VEHICLE SELECTION INFORMATION

After the <STORED DATA BLOCK> is selected, the <VEHICLE SELECTED> information screen is displayed. Press (ENTER) to continue to the NVH parameter display. The number in the right column is the unique vehicle reference number.

ACTIVE KEYS

(ENTER)	Continue to the NVH parameter display.

NVH PARAMETERS

The vehicle parameters for this data block are displayed.

ACTIVE KEYS

(ENTER)	Confirm parameters are correct for the vehicle being tested.

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1.0 GETTING READY

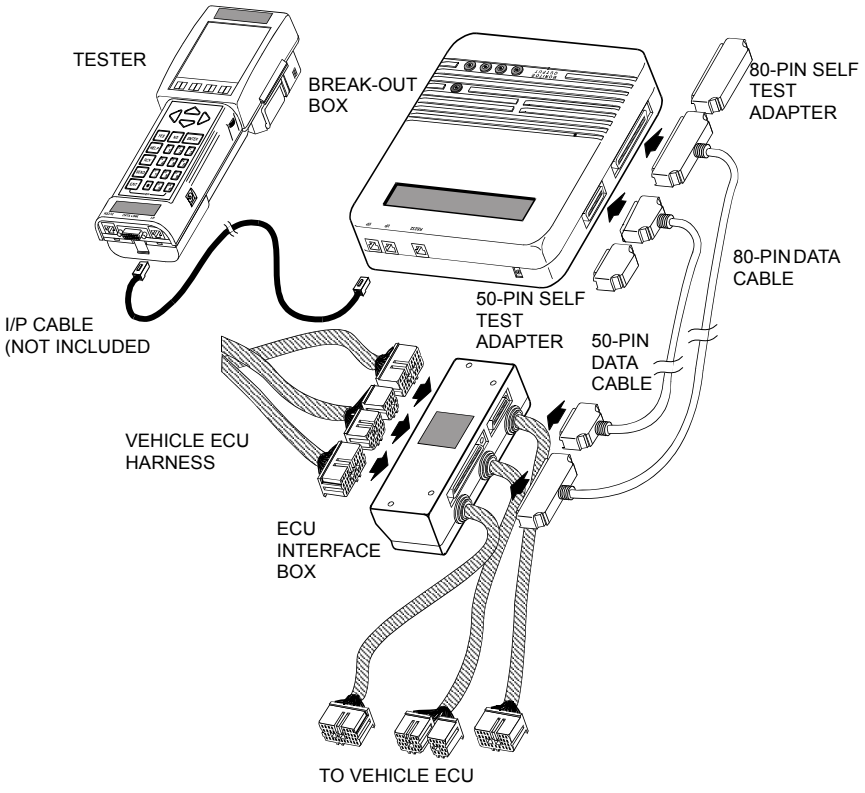
Before using the Break-out Box, the following steps must be performed:

1. Insert the Program Card in the Tester.
2. Connect one end of the I/P cable to the Instrumentation Port (I/P) connector on the bottom right of the Tester. Connect the other end of the I/P cable to one of the I/P connectors on the Break-out Box.
3. Connect the Tester and Break-out Box to a power source. The DC Power Y-adapter can be used to connect both the Tester and Break-out Box to the vehicle cigarette lighter or battery adapter cable.

HINT	Power the Tester and Break-out Box with the battery adapter cable when performing TDS measurements.

4. Perform the vehicle and system selection as described in *Section 2.0 Function and Vehicle Selection on page 217*. When the vehicle and system have been selected, the Tester displays which ECU Interface Box, harness, and connectors are required for the tests.
5. Locate the vehicle ECU harness connector. See the Service Manual or EWD if you are not sure where the ECU is located. After turning the ignition switch off, disconnect the vehicle harness from the ECU.
6. Connect the cable on the ECU Interface Box to the vehicle ECU.
7. Connect the vehicle harness to the ECU Interface Box.
8. Connect the 50-pin and 80-pin Data Cables to the Break-out Box and ECU Interface Box.
9. Verify the secure connection of the cables, etc.

BREAK-OUT BOX



2.0 FUNCTION AND VEHICLE SELECTION

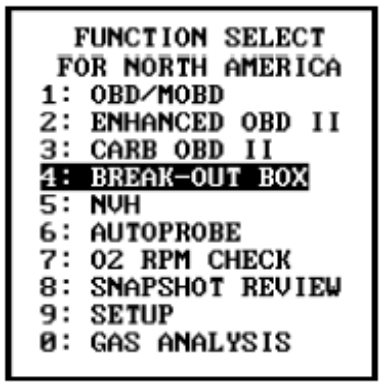
When the Tester is powered up with the Program Card installed, you must confirm and/or enter information about the program card and about the vehicle being tested. The information includes the vehicle make, body type, and engine type.

POWER-UP

The program card identification screen is displayed when the Tester is powered up. Press (ENTER) to continue.

ACTIVE KEY

(ENTER) Proceed to the Function Menu.



SELECTING A FUNCTION

All functions present in the Program Card are displayed. Refer to the following sections for operating instructions:

<1: OBD>	OBD Operator's Manual
<2: ENHANCED OBD II>	OBD II Operator's Manual
<3: CARB OBD II>	OBD II Operator's Manual
<4: BREAK-OUT BOX>	Break-out Box Operator's Manual
<5: NVH>	NVH Operator's Manual
<6: AUTOPROBE>	OBD Operator's Manual, Autoprobe section
<7: O2 RPM CHECK>	OBD Operator's Manual, O2S/RPM section
<8: SNAPSHOT REVIEW>	OBD Operator's Manual, Snapshot Review section
<9: SETUP>	Tester Operator's Manual, Using the Setup Mode
<0: GAS ANALYSIS	Gas Analyzer Operator's Manual, (USA only).

ACTIVE KEYS

△ ▽ Change highlighted menu item.
(1) - (0) Select menu item.
(ENTER) Select highlighted menu item.
(EXIT) Return to the Power-up screen

BRAND SELECTION

When <OBD>, <BREAK-OUT BOX>, or <NVH> is selected from the <MAIN MENU>, the <BRAND SELECTION> menu is displayed only if a vehicle brand has not previously been selected.

To change the vehicle brand, refer to Tester Operator's Manual, Using the Setup Mode section.

SELECTING THE VEHICLE

This screen is only displayed if a vehicle has previously been selected.

From the <VEHICLE SELECT> menu you can select either a new vehicle to test or the last vehicle that was tested. Use the up and down keys to select <NEW VEHICLE> or <LAST VEHICLE>, then press (ENTER).

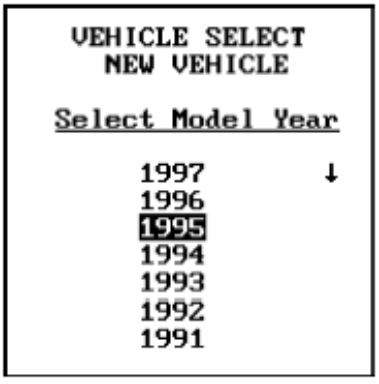
NEW VEHICLE: Select a new vehicle from the vehicle select displays.

LAST VEHICLE: The selection criteria used to select the previous vehicle are displayed. Press (ENTER) to proceed to the Main Menu.

ACTIVE KEYS

△ ▽ Move highlighted cursor between NEW VEHICLE or LAST VEHICLE.
(ENTER) Select the highlighted menu item: either new vehicle or last vehicle.
(EXIT) Return to Main Menu.

NOTE	The term "VEHICLE" indicates the model and system. Select <NEW VEHICLE> in order to test systems different from the previous selection.



MODEL YEAR SELECT SCREEN

The available model years are displayed. The down arrow indicates that there are more selections available than can be displayed on the screen. Use the up and down arrow keys to move the cursor between options, then press (ENTER) to select the model year.

ACTIVE KEYS

△ ▽ Move highlighted cursor between menu options.
(✱)△ Move the display one page.
(✱)▽
(ENTER) Select vehicle type.
(EXIT) Return to New Vehicle/Last Vehicle screen.

MODEL SCREEN

The available model years are displayed. The down arrow indicates that there are more selections available than can be displayed on the screen. Use the up and down arrow keys to move the cursor between options, then press (ENTER) to select the model year.

ACTIVE KEYS

▲ ▼	Move highlighted cursor between menu options.
✱ ▲	Move the display one page.
✱ ▼	
ENTER	Select vehicle type.
EXIT	Return to New Vehicle/Last Vehicle screen.

SYSTEM SELECTION

All available systems for the selected vehicle are displayed. Use the up and down arrow keys to move the cursor between options, then press (ENTER) to select the option.

ACTIVE KEYS

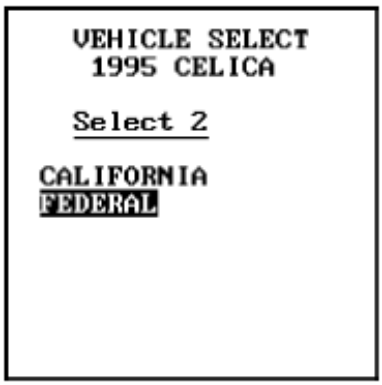
▲ ▼	Move highlighted cursor between options.
ENTER	Select highlighted menu option.
EXIT	Return to previous screen.

VEHICLE SELECT SCREEN(S)

In some cases further vehicle identification is required. Up to five select screens may be displayed to select a particular vehicle. Use the up and down arrow keys to move the cursor between options, then press (ENTER) to select the option.

ACTIVE KEYS

▲ ▼	Move highlighted cursor between options.
ENTER	Select highlighted menu option.
EXIT	Return to previous screen



VEHICLE CONFIRMATION SCREEN

When all of the requested information has been entered, a summary screen of the vehicle configuration is displayed. If the information does not match the vehicle, press (EXIT) to review the previously displayed screens. Correct the information, then proceed through the vehicle selection process again. If the information matches the vehicle you are testing, press (YES) to continue. The number in the right column is the unique vehicle reference number.

ACTIVE KEYS

(YES) Confirm systems selected.
(EXIT) Return to Vehicle Select displays.

CONNECTOR SCREEN

The Tester displays the connections necessary to operate the Break-out Box. Verify that the connections are correct, then press (YES) to continue.

Refer to Step 5 - Step 8 in Section *1.0 Getting Ready on page 215* to connect the indicated Interface Box and connectors to the Break-out Box and vehicle.

ACTIVE KEYS

(YES) Confirm that connections are correct.

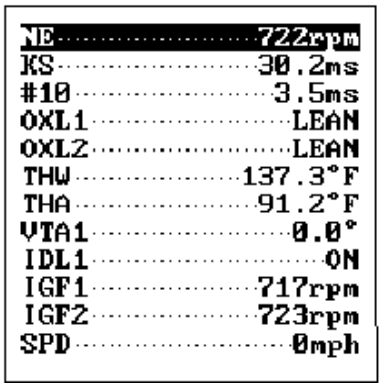
THE BREAK-OUT BOX MAIN MENU

All test modes available for the selected system are displayed. Press the number key for the test you wish to run. Each test mode is described in detail on the following pages.

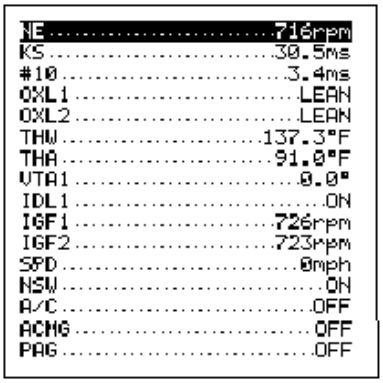
ACTIVE KEYS

△ ▽ Change highlighted menu item.
(1) - (6) Select menu item.
(ENTER) Select highlighted menu item.

3.0 DATA LIST MODE



LARGE CHARACTERS



COMPRESSED CHARACTERS

Press (1) to select the <DATA LIST> mode from the <BREAK-OUT BOX> menu or press (F1) from any display mode. The Tester displays a default list of data parameters.

Twelve parameters using large characters or 16 parameters using compressed characters can be displayed at one time. All parameters can be displayed by pressing the up and down keys.

ACTIVE KEYS

△ ▽	Move the display one parameter.
(*) △	Move the display one page.
(*) ▽	
(F2)	Go to <LED/LIST> mode.
(F3)	Go to <BAR GRAPH> mode.
(F4)	Go to <LINE GRAPH> mode.
(F6)	Set up <STRIP CHART> mode.
(F7)	Toggle between Raw and Converted data for voltage signals.
(F9)	Changes between large and compressed character size.
(F0)	Turn cursor on and off.
(#)(F8)	Start Strip Chart.
(#)(F9)	Stop Strip Chart.
(*)(HELP)	Display parameter information.
(SEND)	Print data list.

HINT	If abnormal signal values are displayed in <DATA LIST> or <CUSTOM DATA> mode, use the <OSCILLOSCOPE> mode to confirm the signal values before replacing any parts.

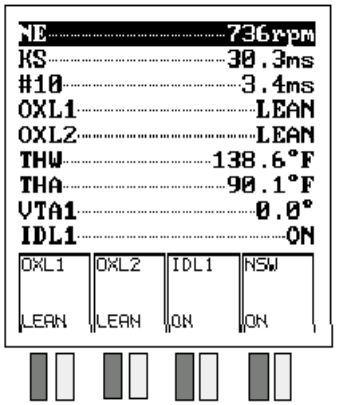
GROUND CHECK

During initialization of the BOB functions, the Tester checks to see if the BOB is correctly connected to the vehicle. If the Tester detects a possible connection problem, this screen is displayed. Please check the following:

- ECU Connectors are improperly connected or damaged.
- BOB harness connectors are improperly connected.
- The vehicle battery is completely discharged.

The Data List display indicates the ground signal which may be open.

LED/LIST MODE



Press (F2) to select the <LED/LIST> mode from any display mode. The <LED/LIST> provides a quick view of the status of four discrete parameters displayed in boxes at the bottom of the Data List display. The <LED/LIST> also allows re-ordering of the displayed parameters.

The status of the selected parameters is displayed at the bottom of the box and is also indicated by the red and green lights beneath each box. The parameters listed can be selected with the Active Keys.

ACTIVE KEYS

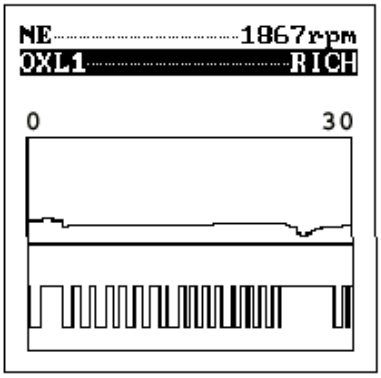
△ ▽	Move the cursor (highlight) up and down.
(YES)	Change the highlighted parameter to the next parameter in the list.
(NO)	Change the highlighted parameter to the previous parameter in the list.
(✱)(YES)	Move to the next parameter not currently displayed.
(✱)(NO)	Move to the previous parameter not currently displayed.
(F1)	Go to <DATA LIST> mode.
(F3)	Go to <BAR GRAPH> mode.
(F4)	Go to <LINE GRAPH> mode.
(F6)	Set up <STRIP CHART> mode.
(F7)	Toggle between Raw and Converted data for voltage signals.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(#)(F8)	Start Strip Chart.
(#)(F9)	Stop Strip Chart.
(✱)(HELP)	Display parameter information.
(SEND)	Print data list.

BAR GRAPH MODE

Press (F3) to select the <BAR GRAPH> mode from any display mode. The <BAR GRAPH> shows relationships among up to five different data parameters (or six parameters using compressed characters). The displayed data parameters can be selected with the Active Keys.

ACTIVE KEYS

▲ ▼	Move the cursor (highlight) up and down.
(YES)	Change the highlighted parameter to the next parameter in the list.
(NO)	Change the highlighted parameter to the previous parameter in the list.
(✱)(YES)	Move to the next parameter not currently displayed.
(✱)(NO)	Move to the previous parameter not currently displayed.
(F1)	Go to <DATA LIST> mode.
(F2)	Go to <LED/LIST> mode.
(F4)	Go to <LINE GRAPH> mode.
(F6)	Set up <STRIP CHART> mode.
(F7)	Toggle between Raw and Converted data for voltage signals.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(#)(F8)	Start Strip Chart.
(#)(F9)	Stop Strip Chart.
(✱)(HELP)	Display parameter information.
(SEND)	Print data list.



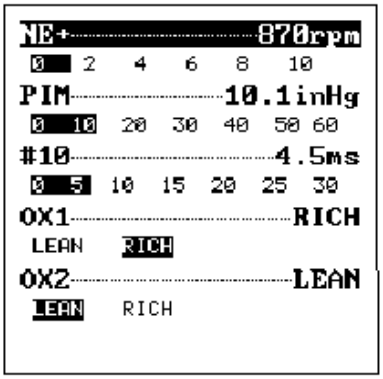
LINE GRAPH MODE

Press (F4) to select the <LINE GRAPH> mode from any display mode. The <LINE GRAPH> displays two data parameters on the moving line graph. The displayed data parameters can be selected with the Active Keys.

The line graph of the upper data parameter is displayed in the upper half of the screen, and the lower data parameter is displayed in the lower half of the screen.

ACTIVE KEYS

◁ ▷ Change Line Graph time scale. Allowable scales are 10, 30, 60, and 100 seconds.
△ ▽ Move the cursor (highlight) up and down.
(YES) Change the highlighted parameter to the next parameter in the list.
(NO) Change the highlighted parameter to the previous parameter in the list.
(F1) Go to <DATA LIST> mode.
(F2) Go to <LED/LIST> mode.
(F3) Go to <BAR GRAPH> mode.
(F6) Set up <STRIP CHART> mode.
(F7) Toggle between Raw and Converted data for voltage signals.
(F9) Change between large and compressed character size.
(F0) Turn cursor on and off.
(#)(F8) Start Strip Chart.
(#)(F9) Stop Strip Chart.
(✱)(HELP) Display parameter information.
(SEND) Print data list.



STRIP CHART MODE

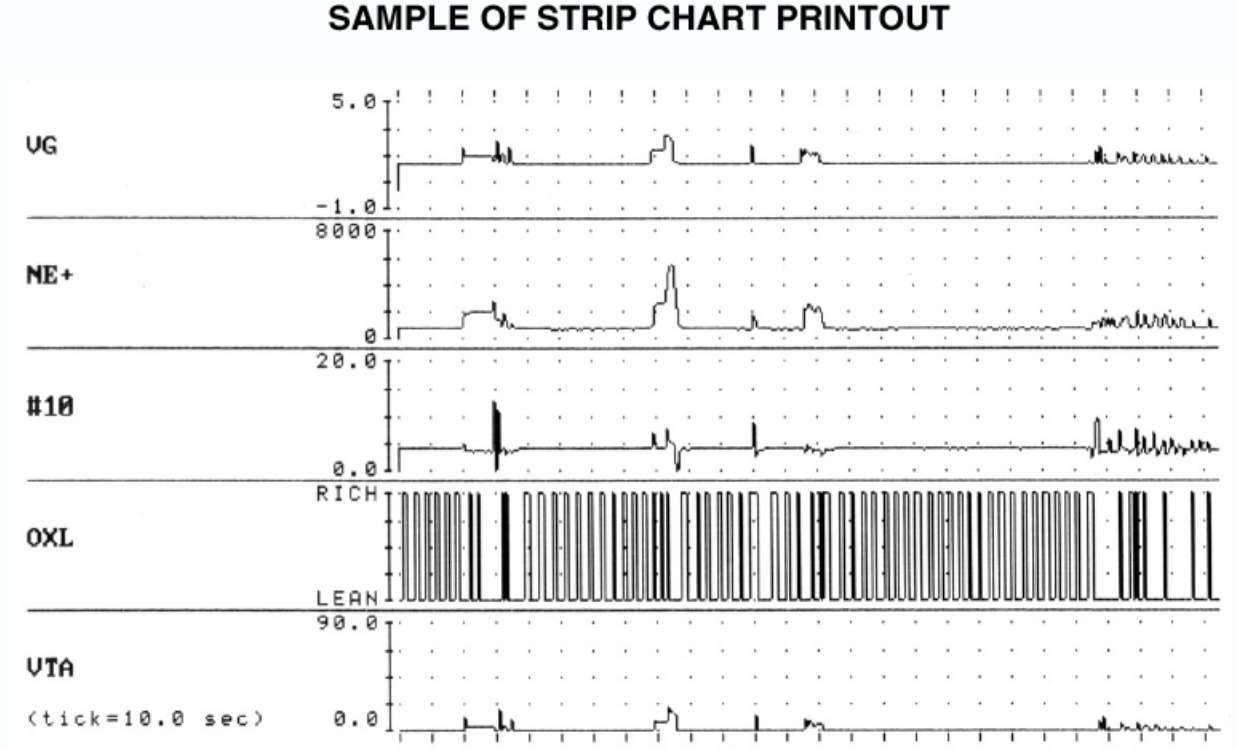
NOTE	This function requires the optional VP-411 or VP-414 printer.

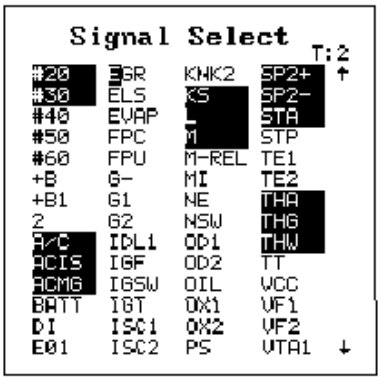
Press (F6) to select the <STRIP CHART> setup from any Data List display. The <STRIP CHART> allows you to select up to five parameters to be printed. The Strip Chart mode only works with the optional VP-411 or VP-414 printer. Press (#)(F8) to start the Strip Chart printing. Live data is printed until it is turned off with (#)(F9) or when you exit Data List.

ACTIVE KEYS

△ ▽	Move the cursor (highlight) up and down.
(YES)	Change the highlighted parameter to the next parameter in the list.
(NO)	Change the highlighted parameter to the previous parameter in the list.
(✱)(YES)	Move to the next parameter not currently displayed.
(✱)(NO)	Move to the previous parameter not currently displayed.
(F1)	Go to <DATA LIST> mode.
(F2)	Go to <LED/LIST> mode.
(F3)	Go to <BAR GRAPH> mode.
(F4)	Go to <LINE GRAPH> mode.
(F7)	Toggle between Raw and Converted data for voltage signals.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(#)(F8)	Start Strip Chart.
(#)(F9)	Stop Strip Chart.
(✱)(HELP)	Display parameter information.
(SEND)	Print data list.

SAMPLE OF STRIP CHART PRINTOUT





4.0 CUSTOM DATA MODE

Press (2) from the <BREAK-OUT BOX MENU> to select the <CUSTOM DATA> mode. Use the arrow keys and (YES) and (NO) keys to select a custom list of signals. The cursor position is shown by a flashing reverse video box on the first character of the signal name. Selected signals are highlighted. Up and Down arrows appear on the right if more signals can be displayed (if there are more than 56 signals). Selected signals are displayed in the order they are selected. Press (ENTER) to terminate signal selection and proceed to the <DATA LIST> mode. All Data List functions are available for Custom Data displays.

NOTE	Maximum of six timing signals can be displayed at once. The counter in the upper right corner of the display indicates the number of available timing signals remaining.

"T:2" in the upper right screen indicates the number of timing signals that can be selected.

ACTIVE KEYS

△ ▽	Move the cursor (highlight) up and down.
◁ ▷	Move the cursor (highlight) left or right.
(YES)	Select a signal.
(NO)	Deselect a previously selected signal.
(ENTER)	Go to Data List Display.

HINT	If abnormal signal values are displayed in <DATA LIST> or <CUSTOM DATA> mode, use the <OSCILLOSCOPE> mode to confirm the signal values before replacing any parts.

GROUND CHECK

During initialization of the BOB functions, the Tester checks to see if the BOB is correctly connected to the vehicle. If the Tester detects a possible connection problem, this screen is displayed. Please check the following:

- ECU Connectors are improperly connected or damaged.
- BOB harness connectors are improperly connected.
- The vehicle battery is completely discharged.

The datalist display indicates the ground signal which may be open.

5.0 USING THE SNAPSHOT MODE

Press (3) to select <SNAPSHOT> mode from the <BREAK-OUT BOX> menu. From the <SNAPSHOT> menu, press (1) to use the default Data List for the snapshot tests. To select a <CUSTOM DATA LIST>, press (2) to display the <SIGNAL SELECT> options. Signal selection is explained in *Section 4.0 Custom Data Mode on page 226*.

Previously captured data may be reviewed by selecting <3: Snapshot Replay>.

Select <4: Trigger Point> to setup the Tester to capture data that occurs before, after, or both before and after the trigger occurs.

ACTIVE KEYS

△ ▽	Change highlighted menu item.
(1) - (4)	Select a snapshot option.
ENTER	Select highlighted menu item.

HINT	If abnormal signal values are displayed in <DATA LIST> or <CUSTOM DATA> mode, use the <OSCILLOSCOPE> mode to confirm the signal values before replacing any parts.

GROUND CHECK

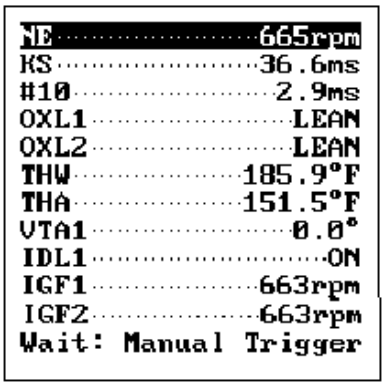
During initialization of the BOB functions, the Tester checks to see if the BOB is correctly connected to the vehicle. If the Tester detects a possible connection problem, this screen is displayed. Please check the following:

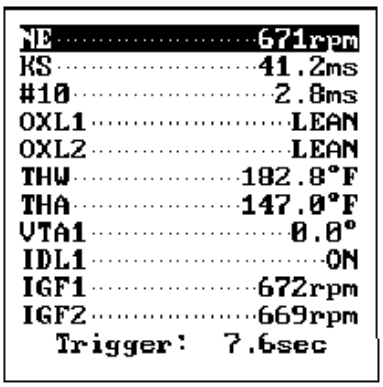
- ECU Connectors are improperly connected or damaged.
- BOB harness connectors are improperly connected.
- The vehicle battery is completely discharged.

The data list display indicates the ground signal which may be open.

SNAPSHOT CAPTURE AND DISPLAY

Data can be captured after selecting <DATA LIST> or <CUSTOM DATA> from the <SNAPSHOT> menu. Press the (ENTER) key to trigger the snapshot and begin capturing data.





DATA CAPTURE PHASE

Use the up and down keys to scroll through all data parameters. <Wait: Manual Trigger> is displayed at the bottom of the screen until the snapshot is triggered. When the (ENTER) key is pressed, <Trigger> is displayed at the bottom of the screen with the number of seconds remaining while data is being saved.

ACTIVE KEYS

◁ ▷ Select snapshot capture time scale. Allowable time scales are 10, 30, 60, and 100 seconds. (<LINE GRAPH> mode only.)

△ ▽ Move the display up or down one parameter.

(✱)△ Move the display one page. (<DATA LIST> mode only.)

(✱)▽

(YES) Change the highlighted parameter to the next parameter in the list. (<LED/LIST>, <BAR GRAPH> and <LINE GRAPH> modes only.)

(NO) Change the highlighted parameter to the previous parameter in the list. (<LED/LIST>, <BAR GRAPH> and <LINE GRAPH> modes only.)

(✱)(YES) Move to the next parameter not currently displayed. (<LED/LIST>, <BAR GRAPH> and <LINE GRAPH> modes only.)

(✱)(NO) Move to the previous parameter not currently displayed. (<LED/LIST>, <BAR GRAPH> and <LINE GRAPH> modes only.)

(ENTER) Trigger the snapshot and terminate data capture.

(F1) Go to <DATA LIST> mode.

(F2) Go to <LED/LIST> mode.

(F3) Go to <BAR GRAPH> mode.

(F4) Go to <LINE GRAPH> mode.

(F7) Toggle between raw and converted data for voltage.

(F9) Change between large and compressed character size.

(F0) Turn cursor on and off.

(✱)(HELP) Display parameter information.

(SEND) Print data list.

SNAPSHOT SAVE

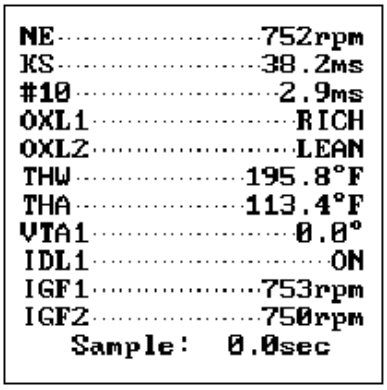
After completion of the data capture, a <SNAPSHOT SAVE> display allows you to save the data for later review.

Press (YES) to save this data set or (NO) to continue without saving the data. The current snapshot can be reviewed immediately even if not saved.

HINT	The snapshot is stored in the Program Card. Make sure that you have the same Program Card when viewing stored data.

ACTIVE KEYS

(YES) Save snapshot data.
(NO) Continue to Data Display phase without saving snapshot data.



DATA DISPLAY PHASE

At the completion of the data capture phase, <Sample> and a time stamp are displayed at the bottom of the screen. Data captured in the snapshot mode can be displayed in all of the formats that are available in the <DATA LIST> mode, except <STRIP CHART>.

ACTIVE KEYS

◁ ▷ Sequence through the sample displayed.
△ ▽ Move the display up or down one parameter.
(✱) △ Move the display one page. (<DATA LIST> mode only.)
(✱) ▽
(YES) Change the highlighted parameter to the next parameter in the list. (<LED/LIST>, <BAR GRAPH> and <LINE GRAPH> modes only.)
(NO) Change the highlighted parameter to the previous parameter in the list. (<LED/LIST>, <BAR GRAPH> and <LINE GRAPH> modes only.)
(✱)(YES) Change to the next parameter not currently displayed. (<LED/LIST>, <BAR GRAPH> and <LINE GRAPH> modes only.)
(✱)(NO) Change to the previous parameter not currently displayed. (<LED/LIST>, <BAR GRAPH> and <LINE GRAPH> modes only.)
(F1) Go to <DATA LIST> mode.
(F2) Go to <LED/LIST> mode.
(F3) Go to <BAR GRAPH> mode.
(F4) Go to <LINE GRAPH> mode.
(F7) Toggle between raw and converted data for voltage.
(F9) Change between large and compressed character size.
(F0) Turn cursor on and off.
(✱)(HELP) Display parameter information.
(SEND) Print data list.

SNAPSHOT REPLAY

Press (3) to select the <SNAPSHOT REPLAY> mode from the <SNAP-SHOT> menu. Snapshot events are listed by the time and date when the snapshot was taken. Use the up and down keys to select an event to replay, then press (ENTER). To delete a snapshot event, highlight the event to be deleted, then press (✱)(ENTER).

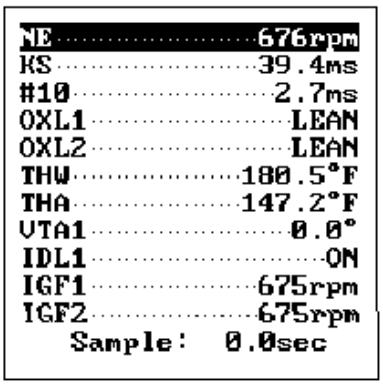
ACTIVE KEYS

△ ▽	Select a snapshot to replay.
(ENTER)	Confirm selection and replay snapshot.
(✱)(ENTER)	Delete highlighted snapshot data.

The vehicle information of the selected snapshot data is displayed.

ACTIVE KEY

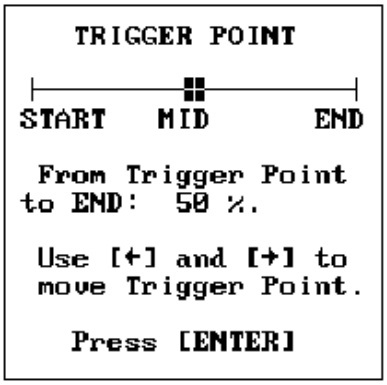
(ENTER)	Displays selected snapshot data.



The data parameters which were captured during the event are displayed. The Data Display phase is indicated by <Sample> and a time stamp.

ACTIVE KEYS

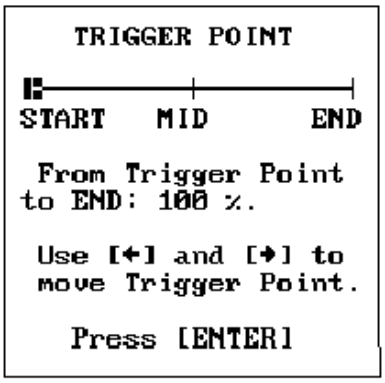
◁ ▷	Sequence through the sample displayed.
△ ▽	Move the display up or down one parameter.
(✱) △	Move the display one page. (<DATA LIST> mode only.)
(✱) ▽	
(YES)	Change the highlighted parameter to the next parameter in the list. (<LED/LIST>, <BAR GRAPH> and <LINE GRAPH> modes only.)
(NO)	Change the highlighted parameter to the previous parameter in the list. (<LED/LIST>, <BAR GRAPH> and <LINE GRAPH> modes only.)
(✱)(YES)	Change to the next parameter not currently displayed.(<LED/LIST>, <BAR GRAPH> and <LINE GRAPH> modes only.)
(✱)(NO)	Change to the previous parameter not currently displayed.(<LED/LIST>, <BAR GRAPH> and <LINE GRAPH> modes only.)
(F1)	Go to <DATA LIST> mode.
(F2)	Go to <LED/LIST> mode.
(F3)	Go to <BAR GRAPH> mode.
(F4)	Go to <LINE GRAPH> mode.
(F7)	Toggle between raw and converted data for voltage.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(✱)(HELP)	Display parameter information.
(SEND)	Print data list.



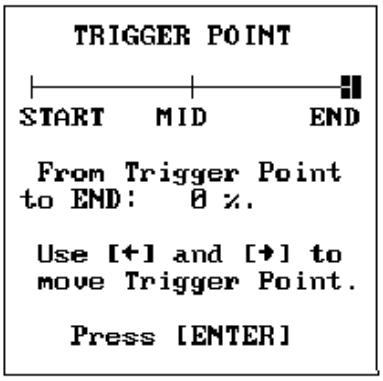
TRIGGER POINT

Press (4) to select <TRIGGER POINT> from the <SNAPSHOT> menu. <TRIGGER POINT> allows you to choose how much data to save after the trigger.

The display at the left stores 50% of the data before and 50% of the data after the trigger point.



The display at the left stores 100% of the data after the trigger point.



The display at the left stores no data after the trigger point.

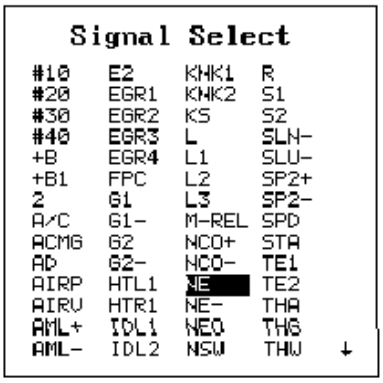
ACTIVE KEYS

◁ ▷ Move the trigger point marker left or right.
(ENTER) Confirm trigger point setting and return to the <SNAPSHOT> menu.

6.0 BREAK-OUT BOX OSCILLOSCOPE FUNCTION

This section provides basic operating instructions for the <OSCILLOSCOPE> function. For complete operating instructions refer to the Autoprobe section in the OBD Operator's Manual.

Press (4) to select <OSCILLOSCOPE> from the <BREAK-OUT BOX> menu. The Oscilloscope mode displays vehicle sensor voltages for analysis. Single Trace and Dual Trace modes are supported. You can plot and compare two signals at the same time by selecting two different parameters.



SIGNAL SELECT

Use the Active Keys to select one or two signals to view, then press (ENTER).

ACTIVE KEYS

△ ▽	Move the cursor (highlight) up and down.
◁ ▷	Move the cursor (highlight) left or right.
(YES)	Select a signal.
(NO)	Deselect a previously selected signal.
(ENTER)	Confirm the selected signal and turns to the oscilloscope screen.

OSCILLOSCOPE DISPLAY

The Oscilloscope screen displays the selected signal(s). You can change the value/division of displayed data using the Active Keys. Refer to the Autoprobe section in the OBD Operator's Manual for detailed instructions on Oscilloscope operation.

ACTIVE KEYS

△	Increase the value of the selected division.
▽	Decrease the value of the selected division.
(0) - (9)	Refer to Autoprobe section in the OBD Operator's Manual.

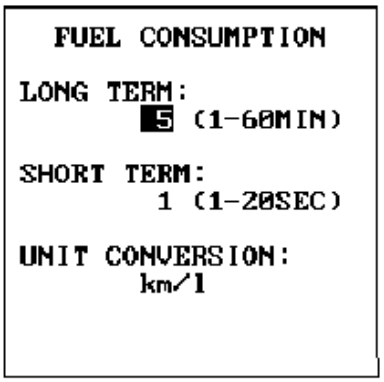
7.0 FUEL CONSUMPTION MENU

Press (5) to select <FUEL CONSUMPTION> from the <BREAK-OUT BOX> menu. The following menu options are available:

<1: DATA LIST>	Display fuel consumption parameters
<2: MANUAL SNAPSHOT>	Capture fuel consumption parameters
<3: REPLAY SNAPSHOT>	Replay fuel consumption snapshots
<4: TRIGGER POINT>	Set snapshot trigger point

ACTIVE KEYS

△ ▽	Change highlighted menu item.
ENTER	Select the highlighted menu entry.
1 - 4	Select menu item.



FUEL CONSUMPTION SETUP

This screen appears after selecting <DATA LIST> or <MANUAL SNAPSHOT> from the <FUEL CONSUMPTION> menu. You can select the time frames that fuel consumption averaging are performed over for both the long and short term averages. Also, the units to be displayed are also selected using this screen.

HINT

The following units are available for fuel consumption calculation:

km/l	= Distance per liter
l/100km	= Liter per 100km
MPG	= Distance per Gallon (3.8l)
MPIG	= Distance per Imperial Gallon (4.5l)

ACTIVE KEYS

△ ▽	Move cursor to <LONG TERM>, <SHORT TERM>, or <UNIT CONVERSION> selection fields.
◁ ▷	Change the value in the current selection field (<LONG TERM>, <SHORT TERM>, or <UNIT CONVERSION>).
ENTER	Continue with <FUEL CONSUMPTION>.
EXIT	Quit <FUEL CONSUMPTION>.

GROUND CHECK

During initialization of the BOB functions, the Tester checks to see if the BOB is correctly connected to the vehicle. If the Tester detects a possible connection problem, this screen is displayed. Please check the following:

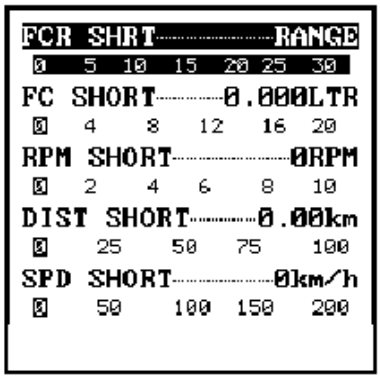
- ECU Connectors are improperly connected or damaged.
- BOB harness connectors are improperly connected.
- The vehicle battery is completely discharged.

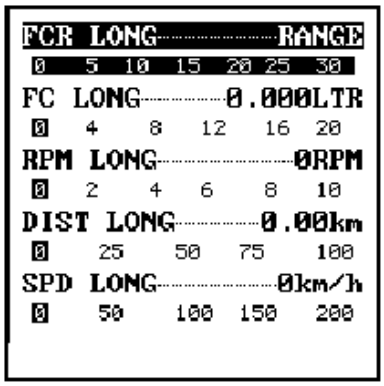
The datalist display indicates the ground signal which may be open.

DATA LIST

Press (1) to select the <DATA LIST> mode from the <FUEL CONSUMPTION SETUP> menu. The Data List displays all of the fuel consumption parameters.

There are three different modes of display for the Fuel Consumption Data List: <DATA LIST>, <BAR GRAPH>, and <LINE GRAPH>.



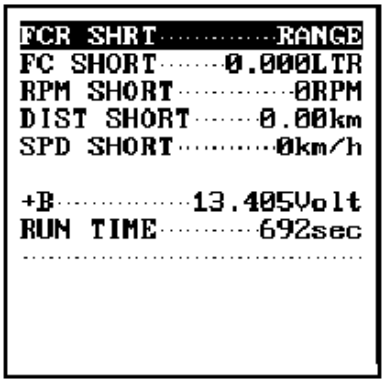


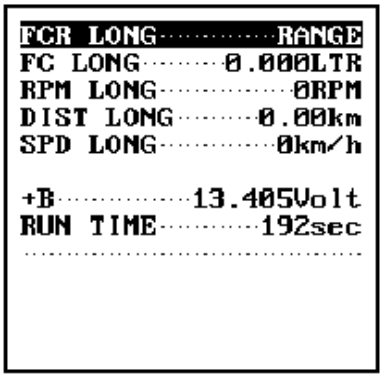
BAR GRAPH MODE

Press (F3) to select the <BAR GRAPH> mode from any Data List display.

ACTIVE KEYS

△ ▽	Move the cursor (highlight) up and down.
(YES)	Change the highlighted parameter to the next parameter in the list.
(NO)	Change the highlighted parameter to the previous parameter in the list.
(✱)(YES)	Change to the next parameter not currently displayed.
(✱)(NO)	Change to the previous parameter not currently displayed.
(F1)	Go to <DATA LIST> mode.
(F4)	Go to <LINE GRAPH> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(✱)(ENTER)	Reset the short and long term averaging for fuel consumption calculations.
(✱)(F1)	Change the units of the displayed parameters (MPG, LTR/100km, km/LTR, MPIG).
(✱)▷	Change between long and short term displays.
(✱)◁	Change between long and short term displays.
(SEND)	Print data list.
(✱)(SEND)	Print screen.





DATA LIST MODE

Press (F1) to select <DATA LIST> mode from any Data List display. This is the default mode.

ACTIVE KEYS

△ ▽ Move the display one parameter.
(✱)△ Move the display one page.
(✱)▽
F3 Go to <BAR GRAPH> mode.
F4 Go to <LINE GRAPH> mode.
F9 Change between large and compressed character size.
F0 Turn cursor on and off.
(✱)(ENTER) Reset the short and long term averaging for fuel consumption calculations.
(✱)(F1) Change the units of the displayed parameters (MPG, LTR/100km, km/LTR, MPIG).
(✱)▷ Change between long and short term displays.
(✱)◁ Change between long and short term displays.
SEND Print data list.
(✱)(SEND) Print screen.

PARAMETER DEFINITION

DESCRIPTION OF PARAMETER	UNIT	MAX.	MIN./ DIGIT	REMARKS
FCR: Fuel Consumption Ratio/ Average for required time period	KM/L MPG L/100 MPIG	99	0.0	
FC: Integrated Fuel Consumption for required time period	LTR Gallon Imp Gal	100.00	0.00	
RPM: Average Engine RPM over required time period	RPM	9999	0	
DIST: Distance for required time period	Km Mile	300	0	
SPD: Average Vehicle Speed for required time period	Km/h MPH	300	0	

LINE GRAPH MODE

Press (F4) to select the <LINE GRAPH> mode from any Data List display.

ACTIVE KEYS

◁ ▷ Change the line graph time scale. Allowable scales are 10, 30, 60, 100, 300, and 600 seconds.
(At Active Test scale is fixed to 30 seconds)
△ ▽ Move the cursor (highlight) up and down.
(YES) Change the highlighted parameter to the next parameter in the list.
(NO) Change the highlighted parameter to the previous parameter in the list.
(F1) Go to <DATA LIST> mode.
(F3) Go to <BAR GRAPH> mode.
(F9) Change between large and compressed character size.
(F0) Turn cursor on and off.
(✱)(ENTER) Reset the short and long term averaging for fuel consumption calculations.
(✱)(F1) Change the units of the displayed parameters (MPG, LTR/100km, km/LTR, MPIG).
(✱)▷ Change between long and short term displays.
(✱)◁ Change between long and short term displays.
(SEND) Print data list.
(✱)(SEND) Print screen.

MANUAL SNAPSHOT MODE

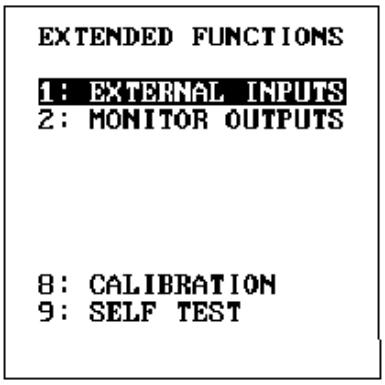
Press (2) to select <MANUAL SNAPSHOT> from the <FUEL CONSUMPTION> menu. This mode is similar in operation to the <SNAPSHOT CAPTURE> (page 228).

REPLAY SNAPSHOT MODE

Press (3) to select <REPLAY SNAPSHOT> from the <FUEL CONSUMPTION> menu. This mode is similar in operation to the <SNAPSHOT REPLAY> (page 230) for the <OBD ENGINE SNAPSHOT> menu.

TRIGGER POINT MODE

Press (4) to select <TRIGGER POINT> from the <FUEL CONSUMPTION> menu. This mode is similar in operation to the <TRIGGER POINT> (page 236).



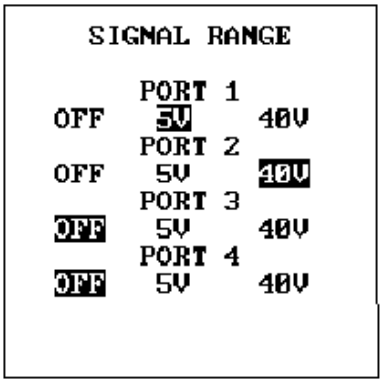
8.0 EXTENDED FUNCTIONS

Press (6) to select <EXTENDED FUNCTIONS> from the <BREAK-OUT BOX> menu. The following additional functions are available:

<1: EXTERNAL INPUTS>	View data associated with each of the four external input channels.
<2. MONITOR OUTPUTS>	Select and monitor four external output signals.
<8: CALIBRATION>	Calibrates the Break-out Box.
<9: SELF TEST>	Perform a Self-Test on the Break-out Box.

ACTIVE KEYS

△ ▽	Change highlighted menu item.
(1) - (9)	Select menu item.
ENTER	Select highlighted menu item.



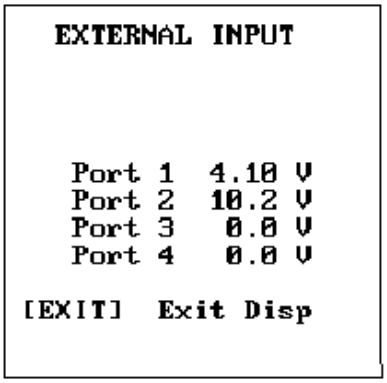
EXTERNAL INPUTS

Press (1) to select <EXTERNAL INPUTS> from the <EXTENDED FUNCTIONS> menu. Select the signal range (or <OFF>) for each of the external ports. Press ENTER to view measurement data.

HINT	"5V" or "40V" on the display indicates the maximum voltage that can be measured.

ACTIVE KEYS

△ ▽	Move highlight up or down.
◁ ▷	Select signal range.
ENTER	Display data.
EXIT	Return to the <EXTENDED FUNCTIONS> menu.

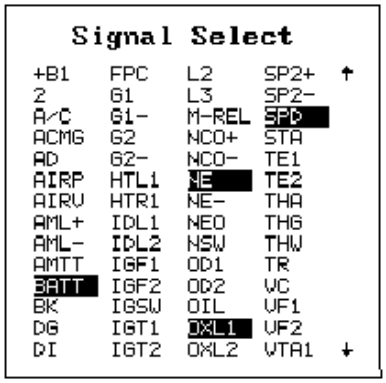


Connect the Autoprobe to one of the four External Input ports on the Break-out Box. Place the Autoprobe tip on the point to be measured. Data associated with each of the four external input channels is displayed.

HINT	In the 5V range, inaccurate data may be displayed before and after the Autoprobe tip is placed on the point of measurement. This is a normal condition.

ACTIVE KEYS

EXIT	Return to the <EXTENDED FUNCTIONS> menu.



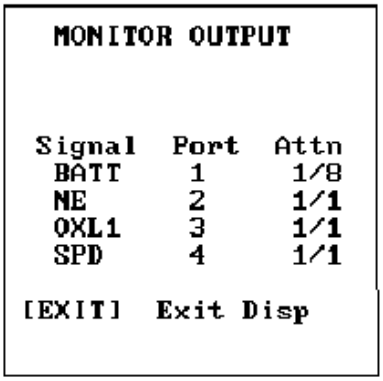
MONITOR OUTPUTS

Connect a voltmeter or oscilloscope to one of the <MONITOR OUTPUT> ports on the Break-out Box. Press (2) to select <MONITOR OUTPUTS> from the <EXTENDED FUNCTIONS> menu. Select up to four signals that are to be mapped to the <MONITOR OUTPUTS> on the top of the Break-out Box. These signals can then be measured by other instruments. Some signals may be attenuated by 1/8 when using this function.

Select the signals to be mapped, then press (ENTER).

ACTIVE KEYS

△ ▽ Move the cursor (highlight) up and down.
◁ ▷ Move the cursor (highlight) left or right.
(YES) Select a signal.
(NO) Deselect a previously selected signal.
(ENTER) Confirm the selected signals.



The <MONITOR OUTPUT> screen displays the current signal mapping and attenuation. 1/8 attenuation indicates a voltmeter reading of 1/8 of actual signal. EXAMPLE: Port 1 (BATT) will read 1.5 volts on your voltmeter if battery voltage is 12 Volt (12/8 = 1.5).

ACTIVE KEYS

(EXIT) Return to the <EXTENDED FUNCTIONS> menu.

CALIBRATION

Press (8) to select <CALIBRATION> from the <EXTENDED FUNCTIONS> menu. The <CALIBRATION> function performs an internal tuning of all analog channels.

Install the self test adapters to the 50- and 80-pin connectors on the Break-out Box. Press (ENTER) to perform the calibration.

ACTIVE KEYS

(ENTER) Confirm that the Self-Test adapter is attached.
Return to <EXTENDED FUNCTIONS> menu when calibration is finished.

(EXIT) Abort calibration and return to <EXTENDED FUNCTIONS> menu.

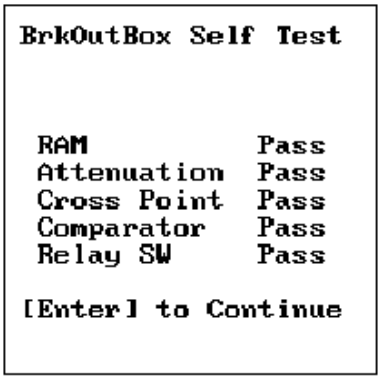
BREAK-OUT BOX SELF-TEST

Press (9) to select <SELF TEST> from the <EXTENDED FUNCTIONS> menu. The Tester instructs you to install the Self-Test adapters prior to performing the Self-Test. The Break-out Box Self-Test verifies the operation of the Break-out Box RAM, attenuators, crosspoint switches, comparator, and relay switches.

ACTIVE KEYS

(ENTER) Confirm that Self-Test adapter is attached.
Return to <EXTENDED FUNCTIONS> menu when Self-Test is finished.

(EXIT) Quit Self-Test and return to <EXTENDED FUNCTIONS> menu.



REPLACING THE NICAD BATTERIES

The capacity of the NiCad batteries decreases over time and the batteries need to be replaced periodically. Please order new batteries from the nearest Vetronix Service Center.

CAUTION!

Only use NiCad rechargeable batteries in the Break-out Box. Other types of batteries may burst causing personal injury and damage to the Tester.

To replace the batteries, do the following:

1. Disconnect the power supply cable from the vehicle and from the Break-out Box.

ATTENTION!

To avoid possible internal damage to the Break-out Box, be sure to disconnect the power supply from the Break-out Box when replacing the batteries.

2. Press (#)(EXIT) to turn the Tester off.
3. Open the battery cover and disconnect the battery pack connector.
4. Remove the battery pack.

ATTENTION!

NiCad batteries are recyclable. Under various state and local laws it may be illegal to dispose of NiCad batteries in the municipal waste system. Check with your local solid waste officials for details in your area for recycling options or proper disposal methods.

5. Install the new battery pack and connect the connector.
6. Place the cover on the Break-out Box.

9.0 BREAK-OUT BOX BATTERY CHARGING AND REPLACEMENT

The Break-out Box contains a rechargeable nickel-cadmium (NiCad) battery pack.

NICAD BATTERY PACK

The NiCad batteries are housed in a removable battery pack located in the upper part of the Break-out Box cover. For normal use the Break-out Box should be powered from the vehicle's cigarette lighter or battery adapter cable. However, on some vehicles power is not available at the cigarette lighter when the ignition is off or when the engine is cranking. The NiCad battery pack provides power to the Break-out Box under these conditions. When fully charged, the battery pack can power the Break-out Box for up to one hour.

NOTE	**Always turn the Tester off when not in use!**

POWER SOURCE WARNING DISPLAY

FIGURE 1 POWER SOURCE WARNING DISPLAY

If the screen on the left is displayed, the external power cable should be connected. If the power cable is disconnected, the measured data will not be accurate.

The power cable is always needed to connect to the vehicle's battery via the Battery Adapter Cable or the cigarette lighter.

HINT	If the data is difficult to read due to the flashing display, use the snapshot mode to capture data, then review the data after the battery is charged.

CHARGING THE BATTERY PACK

The Break-out Box constantly charges the NiCad battery pack as long as it is connected to a 12 VDC power source. In normal use the Break-out Box will keep the battery pack adequately charged. However, if the Break-out Box is used for extended periods of time with the vehicle ignition off, or stored for an extended period of time without use, the NiCad battery pack may become discharged.

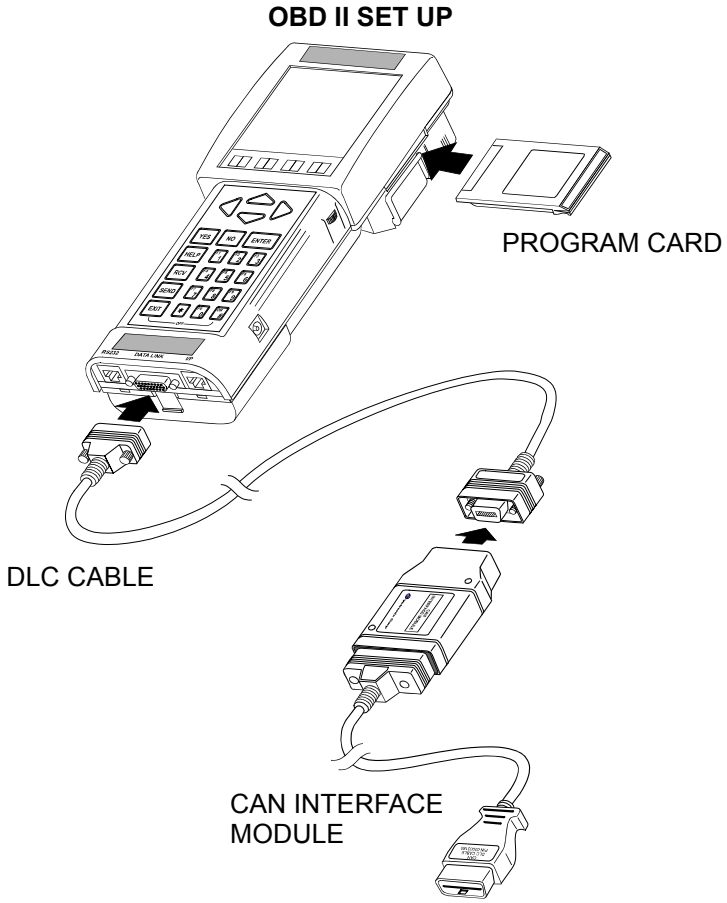
To recharge the battery pack, connect the Tester and Break-out Box to a 12 VDC power source such as the vehicle battery or the 12-volt AC/DC power supply, and turn the Tester and Break-out Box on. It takes approximately 1 hour to fully recharge the battery pack.

Remember, the battery pack is required only when power is not available at the cigarette lighter socket. If the battery pack is not charged and you need to use the Break-out Box, simply connect the Break-out Box directly to the vehicle's battery with the Battery Adapter Cable and cigarette lighter DC power cable supplied with the Tester kit. This allows operation of all diagnostic procedures with the Break-out Box and starts recharging the battery pack at the same time.

1.0 GETTING READY

Before using the OBD II functions of the Program Card, the following steps must be performed.

1. Insert the Program Card into the Tester.
2. Insert the OBD II Cartridge into the Tester.
3. Connect the DLC cable to the Tester.
4. Connect the CAN Module (OBD II Connector) to the DLC cable.
5. Connect the CAN Module cable to the vehicle DLC3.
6. The Tester is powered directly from the DLC3 cable. Press (ON) to turn the Tester on.



2.0 FUNCTION SELECTION

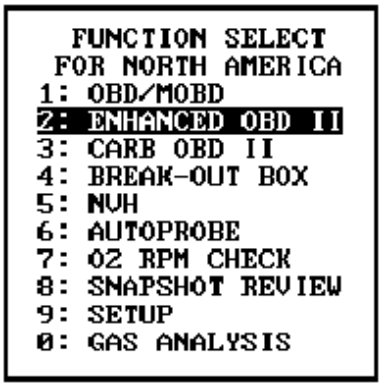
When the Tester is powered up with the Program Card installed, you must confirm and/or enter information about the program card.

POWER-UP

The program card identification screen is displayed when the Tester is powered up. Press (ENTER) to continue.

ACTIVE KEY

(ENTER) Proceed to the <FUNCTION SELECT> Menu.



SELECTING A FUNCTION

All functions present in the Program Card are displayed. Refer to the following sections for operating instructions:

<1: OBD/MOBD>	OBD Operator's Manual
<2: ENHANCED OBD II>	See *Section 3.0 Enhanced OBD II on page 245.*
<3. CARB OBD II>	See *Section 4.0 CARB OBD II on page 275.*
<4: BREAK-OUT BOX>	Break-out Box Operator's Manual
<5: NVH>	NVH Operator's Manual
<6: AUTOPROBE>	OBD Operator's Manual, Autoprobe section
<7: O2 RPM CHECK>	OBD Operator's Manual, O2S/RPM Check section
<8: SNAPSHOT REVIEW>	OBD Operator's Manual, Snapshot Review section
<9: SETUP>	Tester Operator's Manual, Using the Setup Mode section
<0: GAS ANALYSIS>	Gas Analyzer Operator's Manual, (USA only).

ACTIVE KEYS

△ ▽ Change highlighted menu item.
(1) - (0) Select menu item.
(ENTER) Select highlighted menu item.
(EXIT) Return to the Power-up screen.

3.0 ENHANCED OBD II

Press (2) to select <ENHANCED OBD II> from the <FUNCTION SELECT> menu.

DIAGNOSTIC MENU

The Diagnostic Menu is displayed. If Check Mode was selected, <CHECK> is displayed on line 2 of all displays, indicating that the Check Mode is active. Select an item from the menu to run the Enhanced OBD II tests.

<1: DATA LIST>	Display ECU data parameters in several convenient ways.
<2: DTC INFO>	Display information and perform tests based on Trouble Code data.
<3: ACTIVE TEST>	Perform interactive tests with the ECU.
<4: SNAPSHOT>	Capture data parameters to isolate faults.
<5: SYSTEM CHECK>	Perform a system check.
<6: RESET MEMORY>	Reset parameters in the ECU after certain types of repair procedures. Reference the Service Manual before performing this test.
<7: MONITOR STATUS>	Display the status of the vehicle's on-board monitors.
<8: CHECK MODE>	Display Check Mode.

ACTIVE KEYS

△ ▽	Change highlighted menu item.
(1) - (8)	Select menu item.
ENTER	Select highlighted menu item.

DATA LIST SELECTION

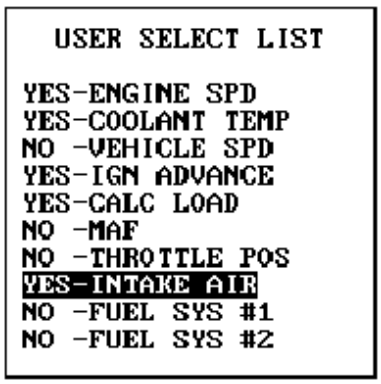
When <1: DATA LIST> is selected from the <DIAGNOSTIC MENU>, you can select <ALL DATA>, <USER DATA>, one of the preset groups of <CUSTOM DATA>, or the <EXTENDED DATA> option. Only the <CUSTOM DATA> supported by the vehicle being tested is displayed.

ACTIVE KEYS

△ ▽ Change highlighted item.
(ENTER) Select highlighted item.

ALL DATA

Choose <ALL DATA> from the <SELECT DATA> menu to proceed directly to the <DATA LIST> mode and display data items reported by the vehicle's controllers. The ALL DATA list contains data items appropriate for most diagnostic situations, but may not include all available items for the vehicle system. To view all possible data items for the vehicle, choose the <EXTENDED DATA> option in the <SELECT DATA> menu. Other data items are displayed in <USER DATA>.



USER DATA

Choose <USER DATA> from the <SELECT DATA> menu to select a subset of data items to display. All of the supported data items are displayed. Use (YES) to select the parameters you want to view. (NO) can be used to deselect a data item. Press (ENTER) to go to the <DATA LIST> mode. The <USER DATA> selection is saved in Tester memory.

ACTIVE KEYS

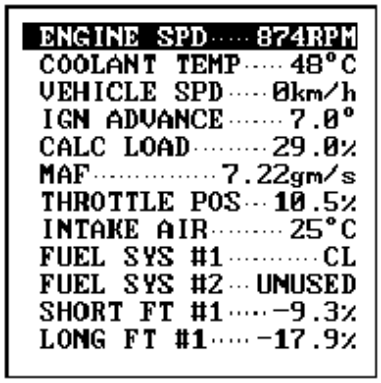
△ ▽ Change highlighted item.
(YES) Select highlighted item.
(NO) Deselect highlighted item.
(ENTER) Go to <DATA LIST> mode.
(✱)(YES) Select all data items.
(✱)(NO) Deselect all data items.

CUSTOM DATA

Additional items on the <SELECT DATA> menu refer to custom subsets of data items that pinpoint diagnosis to a particular system. Custom data lists are based on the vehicle ECU-supported parameters and may vary between vehicles. Selecting a custom data list proceeds directly to the <DATA LIST> mode and displays the appropriate parameters.

EXTENDED DATA

The <EXTENDED DATA> option displays all possible data items for the selected vehicle system, including items which are not normally required for diagnosis. With this option, the update rate of the data list display may be slower than normal due to the large number of data items collected from the vehicle.



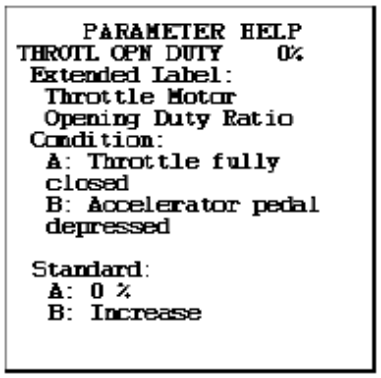
DATA LIST MODE

The <DATA LIST> mode displays data reported by the vehicle's controllers in a list format.

Press (F1) to select the <DATA LIST> mode from any Data List display. This is the default display mode. Twelve parameters using large characters or 16 parameters using compressed characters can be displayed at one time. All parameters can be viewed by pressing the up or down keys.

ACTIVE KEYS

△ ▽	Move the display one parameter.
(✱) △	Move the display one page.
(✱) ▽	
(F2)	Go to <LED/LIST> mode.
(F3)	Go to <BAR GRAPH> mode.
(F4)	Go to <LINE GRAPH> mode.
(F5)	Go to <CUSTOM LIST> mode.
(F6)	Setup <STRIP CHART> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(#) (F8)	Start Strip Chart.
(#) (F9)	Stop Strip Chart.
(✱) (HELP)	Display parameter information.
(SEND)	Print data list.

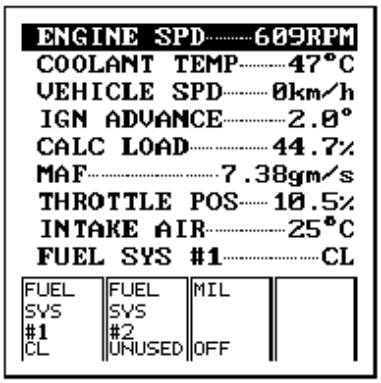


PARAMETER INFORMATION

Press (✱) (HELP) from any Data List mode to display information about the highlighted parameter. The information displayed includes normal operating conditions and expected values.

ACTIVE KEYS

△ ▽	Display next screen.
(EXIT)	Return to Data List display.



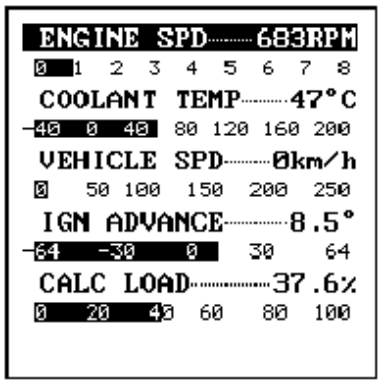
LED/LIST MODE

Press (F2) to select the <LED/LIST> mode from any Data List display. The <LED/LIST> gives you a quick view of the status of four discrete parameters displayed in boxes at the bottom of the Data List display. The <LED/LIST> also allows you to change the order of the displayed parameters.

The status of the selected parameters is displayed at the bottom of the box and is also indicated by the red and green lights beneath each box. The parameters listed can be selected with the Active Keys.

ACTIVE KEYS

▲ ▼	Move the cursor (highlight) up and down.
(YES)	Change the highlighted parameter to the next parameter in the list.
(NO)	Change the highlighted parameter to the previous parameter in the list.
(✱)(YES)	Change to the next parameter not currently displayed.
(✱)(NO)	Change to the previous parameter not currently displayed.
(F1)	Go to <DATA LIST> mode.
(F3)	Go to <BAR GRAPH> mode.
(F4)	Go to <LINE GRAPH> mode.
(F5)	Go to <CUSTOM LIST> mode.
(F6)	Setup <STRIP CHART> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(#)(F8)	Start Strip Chart.
(#)(F9)	Stop Strip Chart.
(✱)(HELP)	Display parameter information.
(SEND)	Print data list.

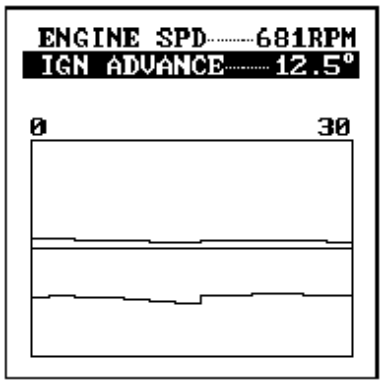


BAR GRAPH MODE

Press (F3) to select the <BAR GRAPH> mode from any Data List display. The <BAR GRAPH> shows relationships of five or six different data parameters. The displayed data parameters can be selected with the Active Keys.

ACTIVE KEYS

△ ▽	Move the cursor (highlight) up and down.
(YES)	Change the highlighted parameter to the next parameter in the list.
(NO)	Change the highlighted parameter to the previous parameter in the list.
(✱)(YES)	Change to the next parameter not currently displayed.
(✱)(NO)	Change to the previous parameter not currently displayed.
(F1)	Go to <DATA LIST> mode.
(F2)	Go to <LED/LIST> mode.
(F4)	Go to <LINE GRAPH> mode.
(F5)	Go to <CUSTOM LIST> mode.
(F6)	Setup <STRIP CHART> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(#)(F8)	Start Strip Chart.
(#)(F9)	Stop Strip Chart.
(✱)(HELP)	Display parameter information.
(SEND)	Print data list.

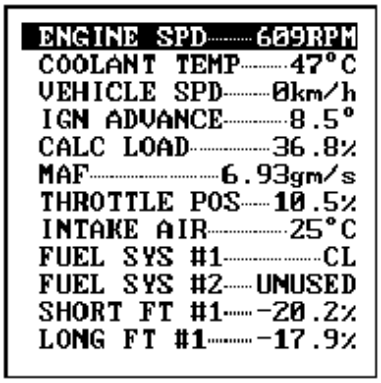


LINE GRAPH MODE

Press (F4) to select the <LINE GRAPH> mode from any Data List display. The <LINE GRAPH> displays two data parameters on the moving line graph. The displayed data parameters can be selected with the Active Keys.

ACTIVE KEYS

◁ ▷	Change Line Graph time scale. Allowable scales are 5, 10, 15, 30, 60, 100, 200, and 300 seconds.
△ ▽	Move the cursor (highlight) up and down.
(YES)	Change the highlighted parameter to the next parameter in the list.
(NO)	Change the highlighted parameter to the previous parameter in the list.
(F1)	Go to <DATA LIST> mode.
(F2)	Go to <LED/LIST> mode.
(F3)	Go to <BAR GRAPH> mode.
(F5)	Go to <CUSTOM LIST> mode.
(F6)	Setup <STRIP CHART> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(#)(F8)	Start Strip Chart.
(#)(F9)	Stop Strip Chart.
(✷)(HELP)	Display parameter information.
(ENTER)	Freeze display.
(SEND)	Print data list.

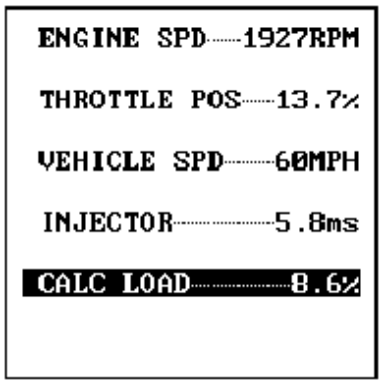


CUSTOM LIST MODE

Press (F5) to select <CUSTOM LIST> from any Data List display. The <CUSTOM LIST> allows you to change the order of the displayed data items.

ACTIVE KEYS

△ ▽	Move the cursor (highlight) up and down.
(YES)	Change the highlighted parameter to the next parameter in the list.
(NO)	Change the highlighted parameter to the previous parameter in the list.
(✱)(YES)	Change to the next parameter not currently displayed.
(✱)(NO)	Change to the previous parameter not currently displayed.
(F1)	Go to <DATA LIST> mode.
(F2)	Go to <LED/LIST> mode.
(F3)	Go to <BAR GRAPH> mode.
(F4)	Go to <LINE GRAPH> mode.
(F6)	Setup <STRIP CHART> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(#)(F8)	Start Strip Chart.
(#)(F9)	Stop Strip Chart.
(✱)(HELP)	Display parameter information.
(SEND)	Print data list.



STRIP CHART MODE

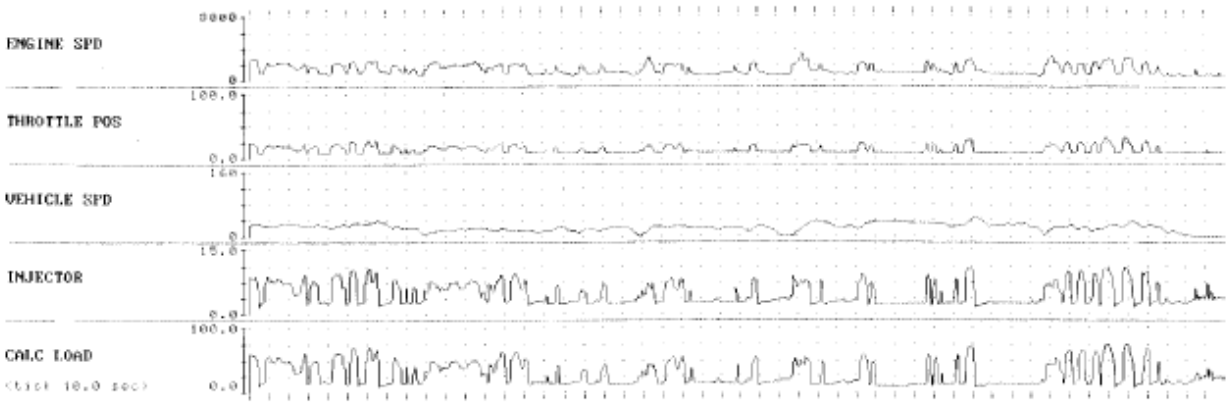
NOTE	This function requires the optional VP-411/VP-414 printer.

Press (F6) to select the <STRIP CHART> setup from any Data List display. The <STRIP CHART> allows you to select five parameters to be printed. The <STRIP CHART> mode only works with the optional VP-411/VP-414 printer. Press (#)(F8) to start the Strip Chart printing. Live data is printed until it is turned off with (#)(F9) or when you exit Data List.

ACTIVE KEYS

△ ▽	Move the cursor (highlight) up and down.
(YES)	Change the highlighted parameter to the next parameter in the list.
(NO)	Change the highlighted parameter to the previous parameter in the list.
(✱)(YES)	Change to the next parameter not currently displayed.
(✱)(NO)	Change to the previous parameter not currently displayed.
(F1)	Go to <DATA LIST> mode.
(F2)	Go to <LED/LIST> mode.
(F3)	Go to <BAR GRAPH> mode.
(F4)	Go to <LINE GRAPH> mode.
(F5)	Go to <CUSTOM LIST> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(#)(F8)	Start Strip Chart.
(#)(F9)	Stop Strip Chart.
(✱)(HELP)	Display parameter information.
(SEND)	Print data list.

SAMPLE OF STRIP CHART PRINTOUT



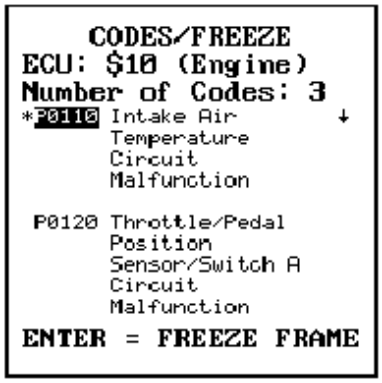
DTC INFO MENU

Press (2) to select <DTC INFO> from the <DIAGNOSTIC> menu. The <DTC INFO> menu is displayed.

<1: CURRENT CODES>	Display codes currently stored in the ECU.
<2: HISTORY CODES>	Display all codes ever stored in the ECU.
<3: PENDING CODES>	Display codes that are pending in the ECU.
<4: CLEAR CODES>	Clear Trouble Codes.
<5: REPAIR CONFIRM>	Verify problem that sets a code or to confirm complete repairs.

ACTIVE KEYS

△ ▽	Change highlighted menu item.
(1) - (5)	Select menu item.
(ENTER)	Select highlighted menu item.



CURRENT CODES

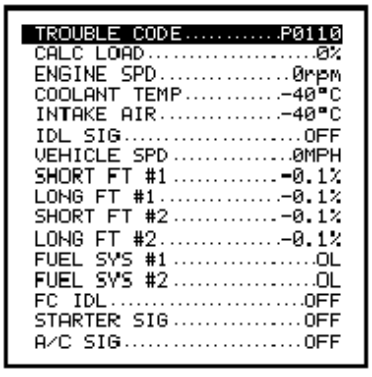
Press (1) to select <CURRENT CODES> from the <DTC INFO> menu. Codes currently stored in the ECU are displayed. The number of stored codes is displayed in the upper right corner.

A "↓" in the upper right of the display indicates that there are more DTCs than can be displayed at one time. Use the △ and ▽ keys to scroll through the list of received Trouble Codes.

A "*" next to the Trouble Code ID indicates there is freeze frame data associated with that DTC. If freeze frame data is available for the highlighted DTC, press (ENTER) to display the <FREEZE DATA>.

ACTIVE KEYS

△ ▽	Move the highlight up or down. Scroll through all Trouble Codes.
(ENTER)	Display Freeze Data.



FREEZE DATA

Freeze Data is only available for certain DTCs. The ECU stores up to two frames of data. The Freeze Data is the state of the sensor and ECU outputs when the DTC was recorded.

The Tester displays all of the parameters saved with the DTC. The Freeze Data does not change (it is static) and does not represent the current ECU state.

The Freeze Data is displayed in a data list format. Only the <DATA LIST> mode is available for Freeze Data.

ACTIVE KEYS

△ ▽	Move the cursor (highlight) up or down.
(✱)(HELP)	Display parameter information.
(EXIT)	Return to Trouble Code review.

DIAG. TROUBLE CODES
ECU: $11 (Engine)
Number of DTCs: 3
P0130 O2 Sensor Circuit Malfunction (Bank 1, Sensor 1)
P0141 O2 Sensor Heater Circuit Malfunction (Bank 1, Sensor 2)
ENTER = FREEZE FRAME
[EXIT] to Continue

HISTORY CODES

Press (2) to select <HISTORY CODES> from the <DTC INFO> menu. The Tester displays all codes ever stored in the ECU. Use the △ and ▽ to view the Trouble Codes.

ACTIVE KEYS

△ ▽ Move the highlight up or down.
Scroll through the Trouble Codes.

(ENTER) Display Freeze Data.

PENDING CODES

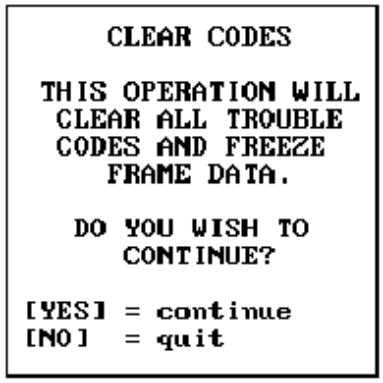
Press (3) to select <PENDING CODES> from the <DTC INFO> menu. Pending Codes currently stored in the ECU are displayed. The number of stored codes is displayed in the upper right corner.

A "↓" in the upper right of the display indicates that there are more DTCs than can be displayed at one time. Use the △ and ▽ keys to scroll through the list of received Trouble Codes.

A "*" next to the DTC Info indicates there is freeze frame data associated with that DTC. If freeze frame data is available for the highlighted DTC, press e to display the <FREEZE DATA>.

ACTIVE KEYS

△ ▽ Move the highlight up or down.
(ENTER) Display Freeze Data.
(EXIT) Return to <Engine Menu>.



CLEAR CODES

Press (4) to select <CLEAR CODES> from the <DTC INFO> menu. The Tester displays the Clear Codes screen. Press (NO) if you do not want to clear the Trouble Codes, or press (YES) to clear the codes.

ACTIVE KEYS

(YES) Clears Trouble Codes and Freeze Data.
(NO) Returns to <TROUBLE DATA> menu without clearing Trouble Codes and Freeze Data.

CLEAR CODES SCREEN #2

The Tester indicates that the Trouble Codes and Freeze Data have been cleared. Press (ENTER) to return to the <TROUBLE CODES> Menu.

ACTIVE KEYS

(ENTER) Return to <TROUBLE DATA> menu.

REPAIR CONFIRMATION

The <REPAIR CONFIRMATION> function is used to verify a problem that sets a code or to confirm complete repairs.

Press (5) to select <REPAIR CONFIRMATION> from the <DTC INFO> menu. Some Trouble Codes are detected during a particular driving pattern. Repairs made to correct these codes can be confirmed using this customized test.

NOTE	This test must be performed before clearing codes.

TABLE 6-1. Applicable codes for this test

Function	Applicable Code
Catalytic Converter	P0420
Oxygen Sensor	P0130, P0133, P0136, P0139, P0142, P0145, P0150, P0153, P0156, P0159, P0162, P0165
Oxygen Sensor Heater	P0135, P0141, P0147, P0155, P0161, P0167
EGR System	P0401, P0402

Select a Trouble Code to verify or for which a repair has been made.

ACTIVE KEYS

△ ▽ Move highlight up or down.
(ENTER) Select Trouble Code; continue with Repair Confirmation.

CLEAR CODES

Press (YES) to clear the codes. Codes must be cleared in order to confirm the repair.

ACTIVE KEYS

(YES) Clear Trouble Code.
(NO) Do not clear codes.

ROAD TEST

Road test the vehicle using the drive pattern in the repair manual for the applicable code. When the road test has been completed, press (ENTER).

CONFIRMATION

After the road test, the Tester requests Trouble Code information from the ECU. If the Trouble Code does not reappear, the problem cannot be duplicated or the repair is complete. If the same Trouble Code is still present, the Tester displays <INCOMPLETE REPAIR>. The Tester also indicates if other Trouble Codes were received.

ACTIVE TEST

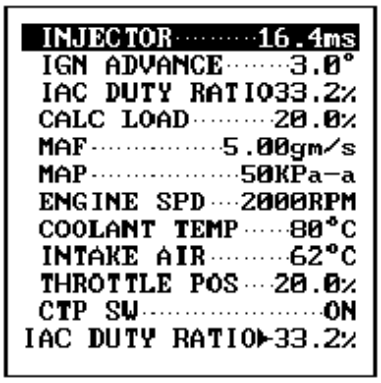
Press (3) to select <ACTIVE TEST> from the <DIAGNOSTIC> menu. This display allows you to choose from a list of active tests to execute. Only active tests supported by the current vehicle are displayed.

ACTIVE KEYS

△ ▽ Change highlighted item.
(ENTER) Select highlighted item.

ALL DATA

Choose <ALL DATA> from the <SELECT DATA> menu to proceed directly to the <ACTIVE TEST> mode and display all of the data items reported by the vehicle's controllers.



ACTIVE TEST DATA LIST

The parameters associated with the active test are displayed in a Data List format. All of the <DATA LIST> modes are available. Use the ◁ and ▷ keys to change the active parameter displayed on the bottom line. In <LINE GRAPH> mode, the time scale is fixed at 30 seconds.

ACTIVE KEYS

◁ ▷	Change Active parameter value.
△ ▽	Move the display up or down one parameter.
✱ △	Move the display one page. (<DATA LIST> mode only.)
✱ ▽	
YES	Change the highlighted parameter to the next parameter in the list. (<LED/LIST>, <BAR GRAPH>, <LINE GRAPH>, and <CUSTOM LIST> modes only.)
NO	Change the highlighted parameter to the previous parameter in the list. (<LED/LIST>, <BAR GRAPH>, <LINE GRAPH>, and <CUSTOM LIST> modes only.)
F1	Go to <DATA LIST> mode.
F2	Go to <LED/LIST> mode.
F3	Go to <BAR GRAPH> mode.
F4	Go to <LINE GRAPH> mode.
F5	Go to <CUSTOM LIST> mode.
F9	Change between large and compressed character size.
F0	Turn cursor on and off.
✱ HELP	Display parameter information.
SEND	Print data list.
EXIT	Return to <TEST DATA> menu.

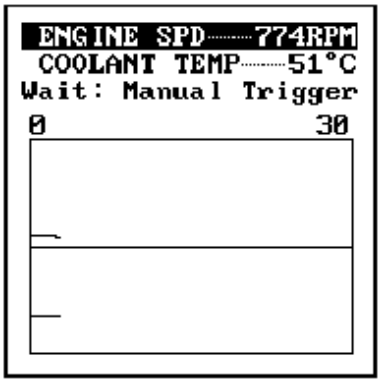
SNAPSHOT

Press (4) to select <SNAPSHOT> from the <DIAGNOSTIC > menu. The <SNAPSHOT> menu is displayed.

<1: MANUAL SNAPSHOT>	Capture a snapshot of data.
<2: CODES SNAPSHOT>	Capture a snapshot of data after a Trouble Code is received.
<3: REPLAY SNAPSHOT>	Replay snapshot.
<4: TRIGGER POINT>	Choose how much data to save after the trigger.
<5: USER DATA>	Select a subset of data items to display.

MANUAL SNAPSHOT

Press (1) to select <MANUAL SNAPSHOT> from the <SNAPSHOT> menu. The <MANUAL SNAPSHOT> function captures a snapshot of data. Select <ALL DATA>, <USER LIST>, or <CUSTOM DATA> list for the snapshot capture.



DATA CAPTURE PHASE

The <LINE GRAPH> mode appears. Use the left and right keys to select the desired time scale for the snapshot. <Wait: Manual Trigger> is displayed on the screen until the snapshot is triggered. When a trigger occurs, <Trigger> is displayed while data is being saved.

ACTIVE KEYS

◁ ▷	Select snapshot capture time scale. Allowable time scales are 5, 10, 15, 30, 60, 100, 200, and 300 seconds.
△ ▽	Move the display up or down one parameter.
✱ △	Move the display one page. (<DATA LIST> mode only.)
✱ ▽	
YES	Change the highlighted parameter to the next parameter in the list. (<LED/LIST>, <BAR GRAPH>, <LINE GRAPH>, and <CUSTOM LIST> modes only.)
NO	Change the highlighted parameter to the previous parameter in the list. (<LED/LIST>, <BAR GRAPH>, <LINE GRAPH>, and <CUSTOM LIST> modes only.)
✱ YES	Change to the next parameter not currently displayed. (<LED/LIST>, <BAR GRAPH>, <CUSTOM LIST>, and <LINE GRAPH> modes only.)
✱ NO	Change to the previous parameter not currently displayed. (<LED/LIST>, <BAR GRAPH>, <CUSTOM LIST>, and <LINE GRAPH> modes only.)
ENTER	Trigger the snapshot and terminate data capture.

SNAPSHOT SAVE

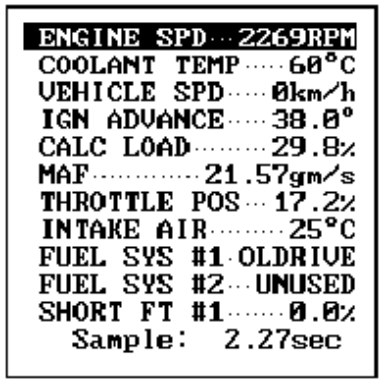
After completion of the data capture, the snapshot can be saved for later review.

Press (YES) to save this data set or (NO) to continue without saving the data. The current snapshot can be reviewed immediately even if not saved.

HINT	The snapshot data is stored on the Program Card. Make sure that the same Program Card is used when reviewing stored snapshot data.

ACTIVE KEYS

(YES) Save snapshot data.
(NO) Go to Data Display phase without saving snapshot.



DATA DISPLAY PHASE

At the completion of the data capture phase, <Sample> and a time stamp are displayed at the bottom of the screen. The trigger point is indicated by a sample of 0.0sec. All data samples have a time stamp relative to the trigger. For a 50% trigger and 30-second data capture, the Tester displays samples from -15.0 seconds to 15.0 seconds.

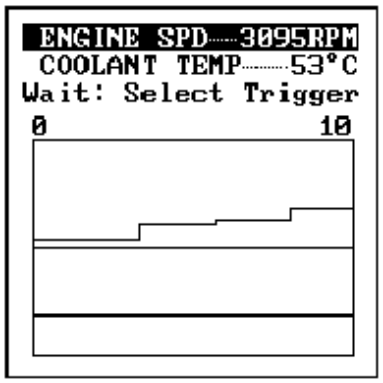
Data captured in the <SNAPSHOT> mode can be displayed in all of the formats that are available in the <DATA LIST> mode, except for Strip Chart.

ACTIVE KEYS

◁ ▷ Sequence through the sample displayed.
△ ▽ Move the display up or down one parameter.
(✱)△ Move the display one page. (<DATA LIST> mode only.)
(✱)▽
(YES) Change the highlighted parameter to the next parameter in the list. (<LED/LIST>, <BAR GRAPH>, <LINE GRAPH>, and <CUSTOM LIST> modes only.)
(NO) Change the highlighted parameter to the previous parameter in the list. (<LED/LIST>, <BAR GRAPH>, <LINE GRAPH>, and <CUSTOM LIST> modes only.)
(✱)(YES) Change to the next parameter not currently displayed. (<LED/LIST>, <BAR GRAPH>, <CUSTOM LIST>, and <LINE GRAPH> modes only.)
(✱)(NO) Change to the previous parameter not currently displayed. (<LED/LIST>, <BAR GRAPH>, <CUSTOM LIST>, and <LINE GRAPH> modes only.)
(F1) Go to <DATA LIST> mode.
(F2) Go to <LED/LIST> mode.
(F3) Go to <BAR GRAPH> mode.
(F4) Go to <LINE GRAPH> mode.
(F5) Go to <CUSTOM LIST> mode.
(F9) Change between large and compressed character size.
(F0) Turn cursor on and off.
(✱)(ENTER) Change ECU.
(✱)(HELP) Display parameter information.
(SEND) Print data list.

CODES SNAPSHOT

Press (2) to select <CODES SNAPSHOT> from the <SNAPSHOT> menu. The <CODES SNAPSHOT> function captures a snapshot of data after a Trouble Code is received. Select <ALL DATA>, <USER LIST>, or <CUSTOM DATA> list for the snapshot capture. The operation of <CODES SNAPSHOT> is identical to <MANUAL SNAPSHOT> except the trigger occurs when any Trouble Code is set.



DATA CAPTURE PHASE

The <LINE GRAPH> mode appears. Use the left and right keys to select the desired time scale for the snapshot. <Wait: Select Trigger> is displayed until the snapshot is triggered. When a trigger occurs, <Trigger> is displayed while data is being saved.

ACTIVE KEYS

◁ ▷ Select snapshot capture time scale. Allowable time scales are 5, 10, 15, 30, 60, 100, 200, and 300 seconds.
△ ▽ Move the display up or down one parameter.
(✱)△ Move the display one page. (<DATA LIST> mode only.)
(✱)▽
YES Change the highlighted parameter to the next parameter in the list. (<LED/LIST>, <BAR GRAPH>, <LINE GRAPH>, and <CUSTOM LIST> modes only.)
NO Change the highlighted parameter to the previous parameter in the list. (<LED/LIST>, <BAR GRAPH>, <LINE GRAPH>, and <CUSTOM LIST> modes only.)
(✱)YES Change to the next parameter not currently displayed. <LED/LIST>, <BAR GRAPH>, <CUSTOM LIST>, and <LINE GRAPH> modes only.)
(✱)NO Change to the previous parameter not currently displayed. (<LED/LIST>, <BAR GRAPH>, <CUSTOM LIST>, and <LINE GRAPH> modes only.)
ENTER Trigger the snapshot and terminates data capture.
F1 Go to <DATA LIST> mode.
F2 Go to <LED/LIST> mode.
F3 Go to <BAR GRAPH> mode.
F4 Go to <LINE GRAPH> mode.
F5 Go to <CUSTOM LIST> mode.
F9 Change between large and compressed character size.
F0 Turn cursor on and off.
(✱)HELP Display parameter information.
SEND Print data list.

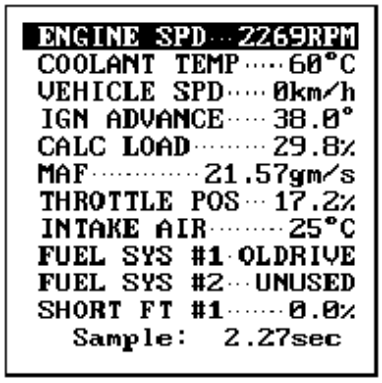
SNAPSHOT SAVE

After completion of the data capture, the snapshot can be saved for later review.

Press YES to save this data set or NO to continue without saving the data. The current snapshot can be reviewed immediately even if not saved.

ACTIVE KEYS

YES Save snapshot data.
NO Continue to Data Display phase without saving snapshot data.



DATA DISPLAY PHASE

At the completion of the data capture phase, <Sample> and a time stamp are displayed at the bottom of the screen. The trigger point is indicated by a sample of 0.0sec. All data samples have a time stamp relative to the trigger. For a 50% trigger and 30-second data capture, the Tester displays samples from _15.0 seconds to 15.0 seconds.

Data captured in the <SNAPSHOT> mode can be displayed in all of the formats that are available in the <DATA LIST> mode, except for Strip Chart.

ACTIVE KEYS

◁ ▷ Sequence through the sample displayed.
△ ▽ Move the display up or down one parameter.
✱ △ Move the display one page. (<DATA LIST> mode only.)
✱ ▽
YES Change the highlighted parameter to the next parameter in the list. (<LED/LIST>, <BAR GRAPH>, <LINE GRAPH>, and <CUSTOM LIST> modes only.)
NO Change the highlighted parameter to the previous parameter in the list. (<LED/LIST>, <BAR GRAPH>, <LINE GRAPH>, and <CUSTOM LIST> modes only.)
✱ YES Change to the next parameter not currently displayed. (<LED/LIST>, <BAR GRAPH>, <CUSTOM LIST>, and <LINE GRAPH> modes only.)
✱ NO Change to the previous parameter not currently displayed. (<LED/LIST>, <BAR GRAPH>, <CUSTOM LIST>, and <LINE GRAPH> modes only.)
F1 Go to <DATA LIST> mode.
F2 Go to <LED/LIST> mode.
F3 Go to <BAR GRAPH> mode.
F4 Go to <LINE GRAPH> mode.
F5 Go to <CUSTOM LIST> mode.
F9 Change between large and compressed character size.
F0 Turn cursor on and off.
✱ ENTER Change ECU.
✱ HELP Display parameter information.
SEND Print data list.

REPLAY SNAPSHOT

Press (3) to select <REPLAY SNAPSHOT> from the <SNAPSHOT> menu.

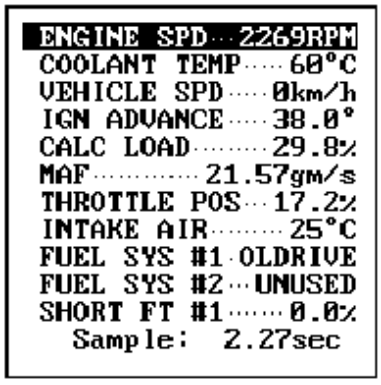
ACTIVE KEYS

△ ▽ Move the cursor (highlight) up and down.
(ENTER) Display the vehicle information of the selected snapshot data.
(✱)(ENTER) Delete selected snapshot from the list.

The vehicle information of the selected snapshot data is displayed.

ACTIVE KEY

(ENTER) Displays selected snapshot data.



The data parameters which were captured during the event are displayed. The Data Display phase is indicated by <Sample> and a time stamp.

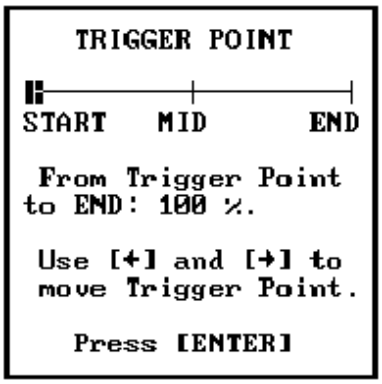
ACTIVE KEYS

◁ ▷ Sequence through the sample displayed.
△ ▽ Move the display up or down one parameter.
(✱)△ Move the display one page. (<DATA LIST> mode only.)
(✱)▽
(YES) Change the highlighted parameter to the next parameter in the list. (<LED/LIST>, <BAR GRAPH>, <LINE GRAPH>, and <CUSTOM LIST> modes only.)
(NO) Change the highlighted parameter to the previous parameter in the list. (<LED/LIST>, <BAR GRAPH>, <LINE GRAPH>, and <CUSTOM LIST> modes only.)
(✱)(YES) Change to the next parameter not currently displayed. (<LED/LIST>, <BAR GRAPH>, <CUSTOM LIST>, and <LINE GRAPH> modes only.)
(✱)(NO) Change to the previous parameter not currently displayed. (<LED/LIST>, <BAR GRAPH>, <CUSTOM LIST>, and <LINE GRAPH> modes only.)
(F1) Go to <DATA LIST> mode.
(F2) Go to <LED/LIST> mode.
(F3) Go to <BAR GRAPH> mode.
(F4) Go to <LINE GRAPH> mode.
(F5) Go to <CUSTOM LIST> mode.
(F9) Change between large and compressed character size.
(F0) Turn cursor on and off.
(✱)(HELP) Display parameter information.
(SEND) Print data list.

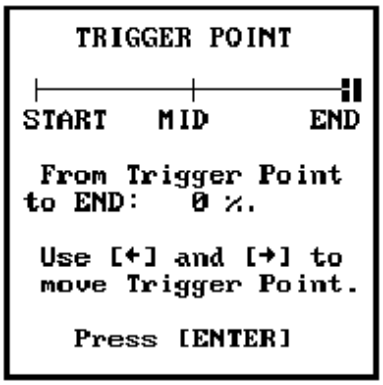
TRIGGER POINT

Press (4) to select <TRIGGER POINT> from the <SNAPSHOT> menu. <TRIGGER POINT> allows you to choose how much data to save after the trigger.

The display at the left stores 50% of the data before and 50% of the data after the trigger point.



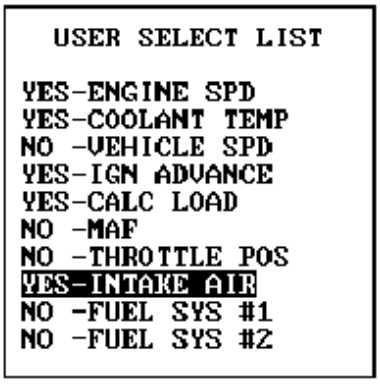
The display at the left stores 100% of the data after the trigger point.



The display at the left stores no data after the trigger point.

ACTIVE KEYS

◁ ▷ Move the trigger point marker left or right.
(ENTER) Confirm trigger point setting and return to the <CURRENT DATA> menu.

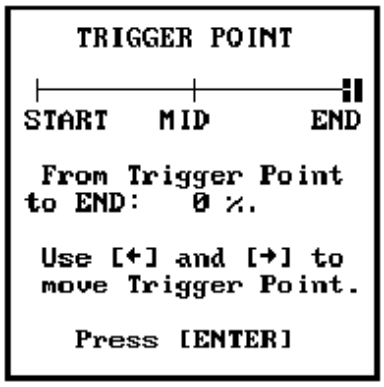


USER DATA

Press (5) to select <USER SELECT> from the <SNAPSHOT> menu. <USER SELECT> allows you to select a subset of data items to display. All of the supported data items are displayed. Use (YES) to select the parameters you want to view. (NO) can be used to deselect a data item. The <USER SELECT> list is saved in Tester memory.

ACTIVE KEYS

△ ▽ Change highlighted item.
(YES) Select highlighted item.
(NO) Deselect highlighted item.
(✱)(YES) Select all data items.
(✱)(NO) Deselect all data items.
(ENTER) Go to <DATA LIST> mode.



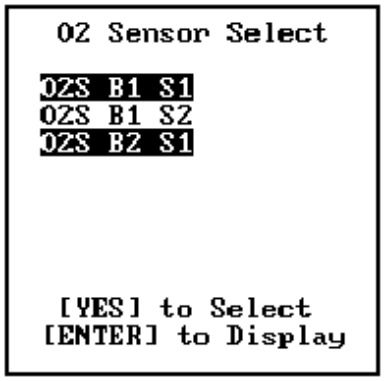
SYSTEM CHECK

Press (5) to select <SYSTEM CHECK> menu from the <DIAGNOSTIC>. The System Check provides access to the O2S/RPM and FUEL CONSUMPTION menus.

<2: O2S/RPM CHECK> View Oxygen sensor voltages.
<3: FUEL CONSUMPTION> Calculate actual fuel used by vehicle.

O2S/RPM CHECK

Press (2) to select <O2S/RPM CHECK> from the <SYSTEM CHECK> menu. The O2S/RPM CHECK provides a way to view the oxygen sensor voltages on a line graph and to monitor the engine RPM.

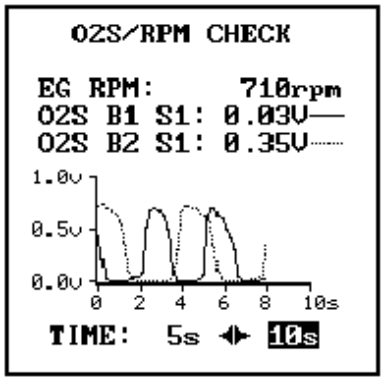


SENSOR SELECTION

The O2 sensors available for this vehicle are displayed. Select up to two sensors and press (ENTER) to continue.

ACTIVE KEYS

△ ▽ Move highlight.
(YES) Select sensor.
(NO) Deselect sensor.
(ENTER) Display data.



DATA DISPLAY

The selected O2 sensor voltages and engine RPM are displayed.

ACTIVE KEYS

◁ ▷ Toggle the time scale between 5 seconds and 10 seconds.
(ENTER) Toggle the display between Hold mode and Real Time mode.
(EXIT) Return to the <TEST DATA> menu.

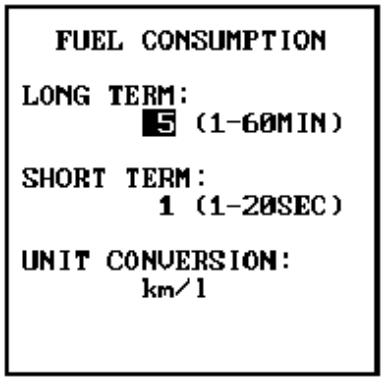
FUEL CONSUMPTION

Press (3) to select <FUEL CONSUMPTION> from the <SYSTEM CHECK> menu. You must then perform the vehicle selection as described in Function and Vehicle Selection section in the OBD Operator's Manual. The fuel consumption function calculates the actual fuel used by the vehicle.

<1: DATA LIST>	Display fuel consumption parameters
<2: MANUAL SNAPSHOT>	Capture fuel consumption parameters
<3: REPLAY SNAPSHOT>	Replay fuel consumption snapshots
<4: TRIGGER POINT>	Set snapshot trigger point

ACTIVE KEYS

△ ▽	Change highlighted menu item.
(ENTER)	Select the highlighted menu entry.
(1) - (4)	Select menu item.



FUEL CONSUMPTION SETUP

This screen appears after selecting <DATA LIST> or <MANUAL SNAPSHOT> from the <FUEL CONSUMPTION> menu. You can select the time frames that fuel consumption averaging will be performed over for both the long and short term averages. The units to be displayed are also selected using this screen.

HINT

The following units are available for the fuel consumption functions:

km/l = Distance per litre
l/100km = Litre per 100km
MPG = Distance per Gallon (3.8l)
MPIG = Distance per Imperial Gallon (4.5l)

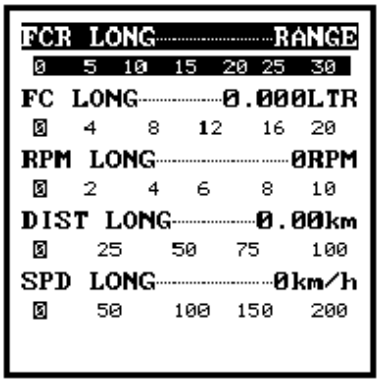
ACTIVE KEYS

△ ▽	Move cursor to <LONG TERM>, <SHORT TERM>, or <UNIT CONVERSION> selection fields.
◁ ▷	Change the value in the current selection field (<LONG TERM>, <SHORT TERM>, or <UNIT CONVERSION>).
(ENTER)	Continue with <FUEL CONSUMPTION>.
(EXIT)	Quit <FUEL CONSUMPTION>.

DATA LIST

Press (1) to select the <DATA LIST> mode from the <FUEL CONSUMPTION SETUP> menu. The Data List displays all of the fuel consumption parameters.

There are three different modes of display for the Fuel Consumption Data List: <DATA LIST>, <BAR GRAPH>, and <LINE GRAPH>.

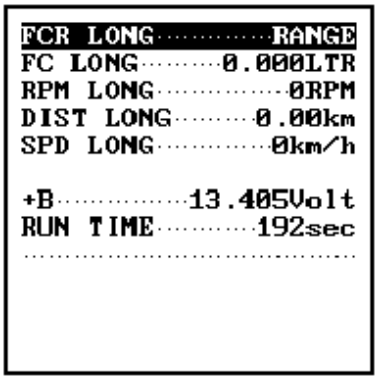


BAR GRAPH MODE

Press (F3) to select the <BAR GRAPH> mode from any Data List display.

ACTIVE KEYS

△ ▽	Move the cursor (highlight) up and down.
(YES)	Change the highlighted parameter to the next parameter in the list.
(NO)	Change the highlighted parameter to the previous parameter in the list.
(✱)(YES)	Change to the next parameter not currently displayed.
(✱)(NO)	Change to the previous parameter not currently displayed.
(F1)	Go to <DATA LIST> mode.
(F4)	Go to <LINE GRAPH> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(✱)(ENTER)	Reset the short and long term averaging for fuel consumption calculations.
(✱)(F1)	Change the units of the displayed parameters (MPG, LTR/100km, km/LTR, MPIG).
(✱)▷	Change between long and short term displays.
(✱)◁	Change between long and short term displays.
(SEND)	Print data list.
(✱)(SEND)	Print screen.



DATA LIST MODE

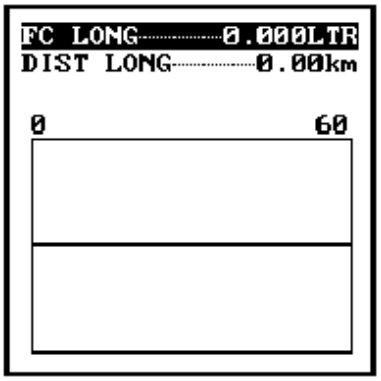
Press (F1) to select <DATA LIST> mode from any Data List display.

ACTIVE KEYS

△ ▽ Move the display one parameter.
✱ △ Move the display one page.
✱ ▽
F3 Go to <BAR GRAPH> mode.
F4 Go to <LINE GRAPH> mode.
F9 Change between large and compressed character size.
F0 Turn cursor on and off.
✱ ENTER Reset the short and long term averaging for fuel consumption calculations.
✱ F1 Change the units of the displayed parameters (MPG, LTR/100km, km/LTR, MPIG).
✱ ▷ Change between long and short term displays.
✱ ◁ Change between long and short term displays.
SEND Print data list.
✱ SEND Print screen.

TABLE 6-2. PARAMETER DEFINITION

DESCRIPTION OF PARAMETER	UNIT	MAX.	MIN./ DIGIT	REMARKS
FCR: Fuel Consumption Ratio/ Average for required time period	KM/L MPG L/100 MPIG	99	0.0	
FC: Integrated Fuel Consumption for required time period	LTR Gallon Imp Gal	100.00	0.00	
RPM: Average Engine RPM over required time period	RPM	9999	0	
DIST Distance for required time period	Km Mile	300	0	
SPD Average Vehicle Speed for required time period	Km/h MPH	300	0	



LINE GRAPH MODE

Press (F4) to select the <LINE GRAPH> mode from any Data List display.

ACTIVE KEYS

◁ ▷ Change the line graph time scale. Allowable scales are 10, 30, 60 and 100, 300, and 600 seconds. (At Active Test scale is fixed to 30 seconds.)

△ ▽ Move the cursor (highlight) up and down.

(YES) Change the highlighted parameter to the next parameter in the list.

(NO) Change the highlighted parameter to the previous parameter in the list.

(F1) Go to <DATA LIST> mode.

(F3) Go to <BAR GRAPH> mode.

(F9) Change between large and compressed character size.

(F0) Turn cursor on and off.

(✱)(ENTER) Reset the short and long term averaging for fuel consumption calculations.

(✱)(F1) Change the units of the displayed parameters (MPG, LTR/100km, km/LTR, MPIG).

(✱)▷ Change between long and short term displays.

(✱)◁ Change between long and short term displays.

(SEND) Print data list.

(✱)(SEND) Print screen.

MANUAL SNAPSHOT MODE

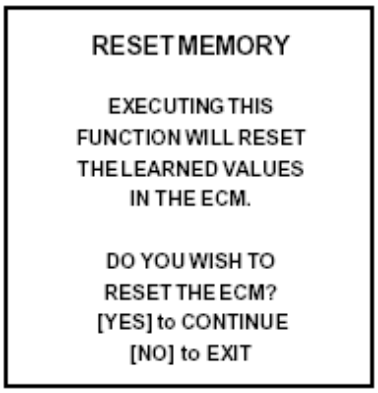
Press (2) to select <MANUAL SNAPSHOT> from the <FUEL CONSUMPTION> menu. This mode is similar in operation to the <MANUAL SNAPSHOT> for the <CURRENT DATA> menu.

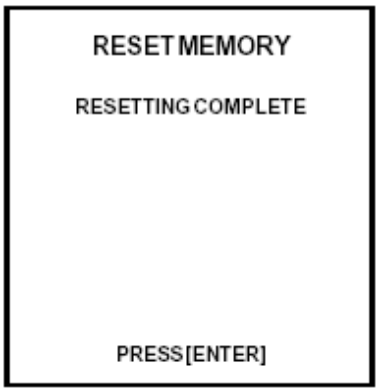
REPLAY SNAPSHOT MODE

Press (3) to select <REPLAY SNAPSHOT> from the <FUEL CONSUMPTION> menu. This mode is similar in operation to the <REPLAY SNAPSHOT> for the <CURRENT DATA> menu.

TRIGGER POINT MODE

Press (4) to select <TRIGGER POINT> from the <FUEL CONSUMPTION> menu. This mode is similar in operation to the <TRIGGER POINT> for the <CURRENT DATA> menu.



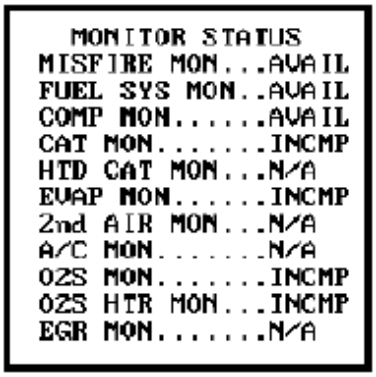


RESET MEMORY

Press (6) to select <RESET MEMORY> from the <DIAGNOSTIC> menu. The <RESET MEMORY> function is used to reset the learned values in the Engine ECU. The <RESET MEMORY> function should only be used after replacing the Engine, Transmission, or Engine ECU. Please reference the Service Manual before performing this test.

ACTIVE KEYS

(YES) Resets the ECM.
(NO) Cancels Reset Memory.



MONITOR STATUS

Press (7) to select <MONITOR STATUS> from the < DIAGNOSTIC>. The <MONITOR STATUS> mode allows you to display the status of the vehicle's on-board monitors, which monitor the operation of the emissions-related components. These monitors must run in order for the DTC and test result displays to accurately reflect the condition of the vehicle's emissions-related components.

The first three display items indicate the systems or components which are continuously monitored. If the Tester displays N/A (Not Available), the vehicle is not capable of continuously monitoring that system.

- Misfire monitoring
- Fuel system monitoring
- Comprehensive component monitoring

The other eight display items indicate the status of the tests which are performed “once per trip”:

- Catalyst monitoring
- Heated catalyst monitoring
- Evaporative system monitoring
- Secondary air system monitoring
- A/C system refrigerant monitoring
- Oxygen sensor monitoring
- Oxygen sensor heater monitoring
- EGR system monitoring

The systems or components listed above can be Completed (COMPL), Not Completed (INCMPL), or Not Available (N/A).

DIAGNOSTIC MODE
1: NORMAL MODE
2: CHECK MODE
WARNING: ENTERING CHECK MODE WILL ERASE ALL STORED TROUBLE CODES AND FREEZE FRAMES

DIAGNOSTIC MODE

Enhanced OBD II can be run in <NORMAL MODE> or <CHECK MODE>. Use the △ and ▽ to select the Diagnostic Mode for Enhanced OBD II.

Use <CHECK MODE> when attempting to duplicate intermittent faults that set DTCs. <CHECK MODE> enables the OBD II system to set DTCs easier by inhibiting two-trip code detection logic and forcing “once per trip” tests to be run.

CAUTION!

CAUTION

Entering the <CHECK MODE> erases all Trouble Codes and Freeze Data.

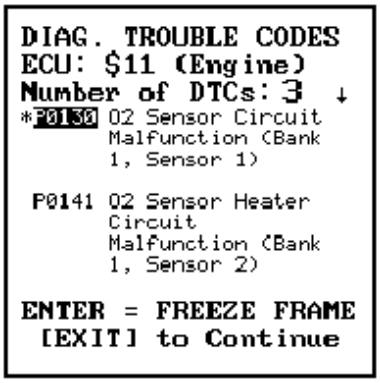
ACTIVE KEYS

△ ▽ Change highlighted item.
(1) Select Normal Mode.
(2) Select Check Mode.
(ENTER) Select highlighted item.

NORMAL MODE

If Normal Mode is selected, the Tester displays the Diagnostic Menu.

CHECK MODE


DIAG. TROUBLE CODES
ECU: $11 (Engine)
Number of DTCs: 3
*P0130 O2 Sensor Circuit Malfunction (Bank 1, Sensor 1)
P0141 O2 Sensor Heater Circuit Malfunction (Bank 1, Sensor 2)
ENTER = FREEZE FRAME
[EXIT] to Continue

If Check Mode is selected and there are stored Trouble Codes, the Tester displays a list of the currently stored Trouble Codes. Review the Trouble Codes and Freeze Data before proceeding.

CAUTION!

CAUTION

Make a record of any stored DTCs before entering Check Mode because codes will be erased once Check Mode is entered.

ACTIVE KEYS

(ENTER) View Freeze Data.
(EXIT) Continue with Check Mode.

CHECK MODE CONFIRMATION

Perform the steps displayed on the Tester screen. Press (ENTER) when the steps are completed. When Check Mode is selected, the Tester commands the ECU to inhibit two-trip code detection logic and automatically run the Once Per Trip tests.

ACTIVE KEYS

(ENTER) Proceed to Check Mode Enhanced OBD II Menu.

OBD II STATUS
NOT ALL OF THE OBD II SYSTEM READINESS TESTS HAVE COMPLETED ON THIS VEHICLE. SOME OF THE TEST RESULTS MAY BE INACCURATE.
PRESS [ENTER]

4.0 CARB OBD II

Press (3) to select <CARB OBD II> from the <FUNCTION SELECT> menu. The Carb OBD II function performs basic OBD II testing on the vehicle. The <CARB OBD II> function can be used to diagnose Toyota/Lexus and other manufacturers' vehicles. If the Tester determines that the ECU has not completed all of the readiness tests, it displays a warning message. You can then select the <READINESS TESTS> from the <OBD II FUNCTIONS> menu to examine the status of these tests. Press (ENTER) to display the <OBD II FUNCTIONS> menu. Carb OBD II includes functions that are different from Enhanced OBD II.

If the vehicle you are testing contains more than one OBD II ECU, the Tester displays a list of all ECUs which have responded during the initialization process. Refer to Section *5.0 Displaying Data For Multiple ECUs on page 299* for more information.

<1: DATA LIST>	Display vehicle parameters (Mode 1).
<2: DTCs>	Display Diagnostic Trouble Codes (Mode 3).
<3: SNAPSHOT>	Capture and review vehicle parameters.
<4: FREEZE DATA>	Display Trouble Code Freeze Data (Mode 2).
<5: CLEAR DIAG INFO>	Clear Trouble Codes.
<6: O2S TEST RESULTS>	Display O2S Test Results (Mode 5).
<7: READINESS TESTS>	Display status of on-board monitors.
<8: UNIT CONVERSION>	Select unit for parameter display.
<9: ADVANCED OBD II>	Perform advanced functions.
<0: INFORMATION>	Obtain vehicle information.

ACTIVE KEYS

△ ▽	Move highlight.
(1) - (0)	Select desired function.
(ENTER)	Select highlighted function.

DATA LIST

Press (1) to select <DATA LIST> from the <OBD II FUNCTIONS> menu.

The Data List mode displays the current state of diagnostic data parameters as reported by the vehicle's ECU(s). This is commonly referred to as Mode 1 data.

If the vehicle contains more than one OBD II ECU, select the primary ECU for the display of diagnostic information. Refer to Section *5.0 Displaying Data For Multiple ECUs on page 299* for more information.

PARAMETER SELECTION

ALL DATA

Choose <ALL DATA> from the <SELECT DATA> menu to proceed directly to the <DATA LIST> mode and display all of the data items reported by the vehicle's controllers.

USER DATA

Choose <USER DATA> from the <SELECT DATA> menu to select a subset of data items to display. All of the available data items are displayed. Use (YES) to select the parameters you want to view. (NO) can be used to deselect a data item. Press (ENTER) to go to <DATA LIST> mode.

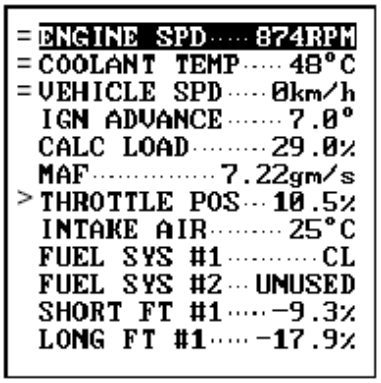
ACTIVE KEYS

△ ▽	Change highlighted item.
(YES)	Select highlighted item.
(NO)	Deselect highlighted item.
(✱)(YES)	Select all data items.
(✱)(NO)	Deselect all data items.
(ENTER)	Go to <DATA LIST> mode.

MULTIPLE ECUs

If the vehicle supports multiple ECUs, a status character to the left of the diagnostic data parameter indicates the status of the parameter data. Refer to *Section 5.0 Displaying Data For Multiple ECUs on page 299* for a detailed description of the tolerances for the different parameters.

CHARACTER	STATUS
=	Indicates multiple controllers are reporting approximately the same value for the parameter.
>	Indicates multiple controllers are reporting different values for the parameter.



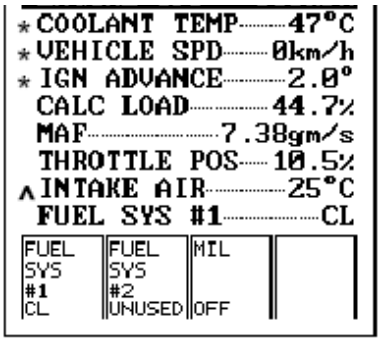
DATA LIST MODE

The <DATA LIST> mode displays data reported by the vehicle's controllers in a list type format. In some vehicles, OBD II information is reported by more than one ECU. The Tester displays an "=" if more than one controller is reporting the same value for a data item. A ">" indicates that the data item is being reported by more than one ECU (controller) and that the values are different. Press ✱ ENTER to change which ECU data is displayed. Press ✱ HELP to view parameter information, which identifies the reporting ECU.

Press F1 to select the <DATA LIST> mode from any Data List display. This is the default display mode. Twelve parameters using large characters or 16 parameters using compressed characters can be displayed at one time. All parameters can be viewed by pressing the up or down keys.

ACTIVE KEYS

△ ▽	Move the display one parameter.
✱ △	Move the display one page.
✱ ▽	
F2	Go to <LED/LIST> mode.
F3	Go to <BAR GRAPH> mode.
F4	Go to <LINE GRAPH> mode.
F5	Go to <CUSTOM LIST> mode.
F6	Setup <STRIP CHART> mode.
F9	Change between large and compressed character size.
F0	Turn cursor on and off.
# F8	Start Strip Chart.
# F9	Stop Strip Chart.
✱ ENTER	Change ECU.
✱ HELP	Display parameter information.
SEND	Print data list.



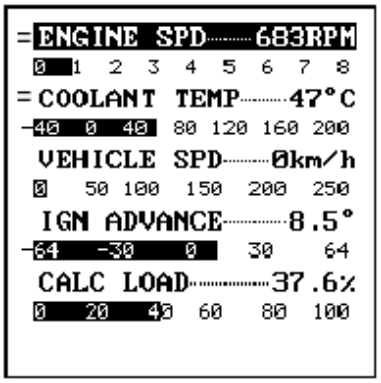
LED/LIST MODE

Press (F2) to select the <LED/LIST> mode from any Data List display. The <LED/LIST> gives you a quick view of the status of four discrete parameters displayed in boxes at the bottom of the Data List display. The <LED/LIST> also allows you to change the order of the displayed parameters.

The status of the selected parameters is displayed at the bottom of the box and is also indicated by the red and green lights beneath each box. The parameters listed can be selected with the Active Keys.

ACTIVE KEYS

⌃ ⌄	Move the cursor (highlight) up and down.
(YES)	Change the highlighted parameter to the next parameter in the list.
(NO)	Change the highlighted parameter to the previous parameter in the list.
(✱)(YES)	Change to the next parameter not currently displayed.
(✱)(NO)	Change to the previous parameter not currently displayed.
(F1)	Go to <DATA LIST> mode.
(F3)	Go to <BAR GRAPH> mode.
(F4)	Go to <LINE GRAPH> mode.
(F5)	Go to <CUSTOM LIST> mode.
(F6)	Setup <STRIP CHART> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(#)(F8)	Start Strip Chart.
(#)(F9)	Stop Strip Chart.
(✱)(ENTER)	Change ECU.
(✱)(HELP)	Display parameter information.
(SEND)	Print data list.

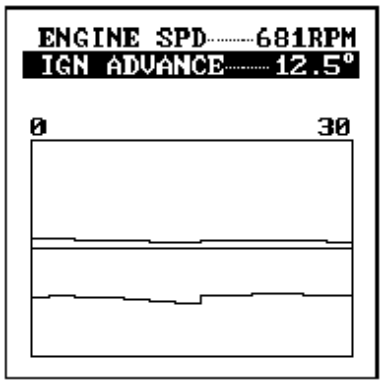


BAR GRAPH MODE

Press (F3) to select the <BAR GRAPH> mode from any Data List display. The <BAR GRAPH> shows relationships among up to five different data parameters (or six parameters using compressed characters). The displayed data parameters can be selected with the Active Keys.

ACTIVE KEYS

▲ ▼	Move the cursor (highlight) up and down.
(YES)	Change the highlighted parameter to the next parameter in the list.
(NO)	Change the highlighted parameter to the previous parameter in the list.
(✱)(YES)	Change to the next parameter not currently displayed.
(✱)(NO)	Change to the previous parameter not currently displayed.
(F1)	Go to <DATA LIST> mode.
(F2)	Go to <LED/LIST> mode.
(F4)	Go to <LINE GRAPH> mode.
(F5)	Go to <CUSTOM LIST> mode.
(F6)	Setup <STRIP CHART> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(#)(F8)	Start Strip Chart.
(#)(F9)	Stop Strip Chart.
(✱)(ENTER)	Change ECU.
(✱)(HELP)	Display parameter information.
(SEND)	Print data list.

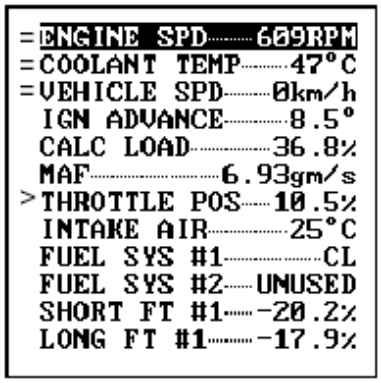


LINE GRAPH MODE

Press (F4) to select the <LINE GRAPH> mode from any Data List display. The <LINE GRAPH> displays two data parameters on the moving line graph. The displayed data parameters can be selected with the Active Keys.

ACTIVE KEYS

◁ ▷	Change Line Graph time scale. Allowable scales are 5, 10, 15, 30, 60, 100, 200, and 300 seconds.
△ ▽	Move the cursor (highlight) up and down.
(YES)	Change the highlighted parameter to the next parameter in the list.
(NO)	Change the highlighted parameter to the previous parameter in the list.
(F1)	Go to <DATA LIST> mode.
(F2)	Go to <LED/LIST> mode.
(F3)	Go to <BAR GRAPH> mode.
(F5)	Go to <CUSTOM LIST> mode.
(F6)	Setup <STRIP CHART> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(#)(F8)	Start Strip Chart.
(#)(F9)	Stop Strip Chart.
(✱)(ENTER)	Change ECU.
(✱)(HELP)	Display parameter information.
(ENTER)	Freeze display.
(SEND)	Print data list.

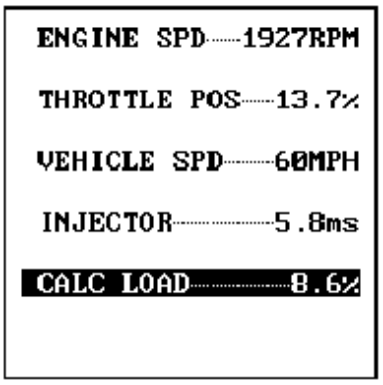


CUSTOM LIST MODE

Press (F5) to select <CUSTOM LIST> from any Data List display. The <CUSTOM LIST> allows you to change the order of the displayed data items.

ACTIVE KEYS

△ ▽	Move the cursor (highlight) up and down.
(YES)	Change the highlighted parameter to the next parameter in the list.
(NO)	Change the highlighted parameter to the previous parameter in the list.
(✱)(YES)	Change to the next parameter not currently displayed.
(✱)(NO)	Change to the previous parameter not currently displayed.
(F1)	Go to <DATA LIST> mode.
(F2)	Go to <LED/LIST> mode.
(F3)	Go to <BAR GRAPH> mode.
(F4)	Go to <LINE GRAPH> mode.
(F6)	Setup <STRIP CHART> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(#)(F8)	Start Strip Chart.
(#)(F9)	Stop Strip Chart.
(✱)(ENTER)	Change ECU.
(✱)(HELP)	Display parameter information.
(SEND)	Print data list.



STRIP CHART MODE

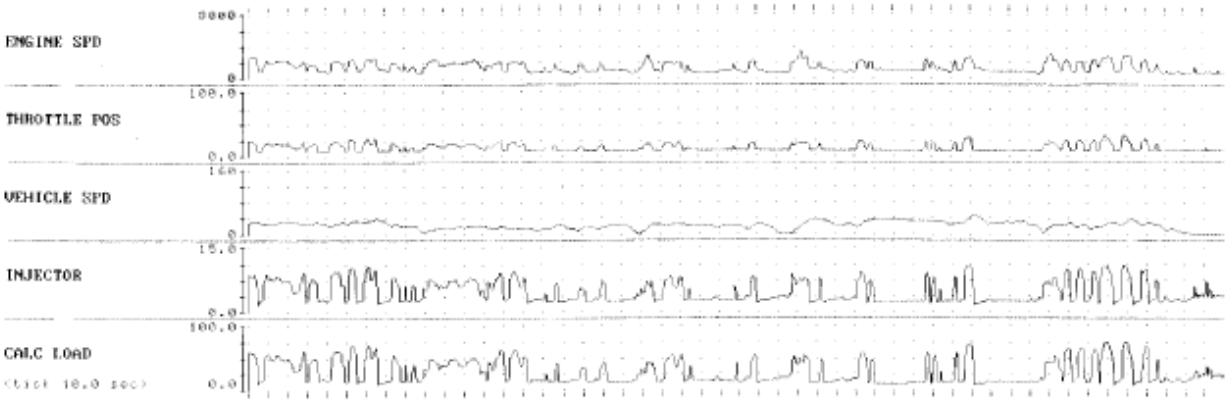
NOTE	This function requires the optional VP-411/VP-414 printer.

Press (F6) to select the <STRIP CHART> setup from any Data List display. The <STRIP CHART> allows you to select up to five parameters to be printed. The Strip Chart mode only works with the optional VP-411/VP-414 printer. Press (#)(F8) to start the Strip Chart printing. Live data is printed until it is turned off with (#)(F9) or when you exit Data List.

ACTIVE KEYS

△ ▽	Move the cursor (highlight) up and down.
(✱)(YES)	Change the highlighted parameter to the next parameter in the list.
(✱)(NO)	Change the highlighted parameter to the previous parameter in the list.
(F1)	Go to <DATA LIST> mode.
(F2)	Go to <LED/LIST> mode.
(F3)	Go to <BAR GRAPH> mode.
(F4)	Go to <LINE GRAPH> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(#)(F8)	Start Strip Chart.
(#)(F9)	Stop Strip Chart.
(✱)(ENTER)	Change ECU.
(✱)(HELP)	Display parameter information.
(SEND)	Print data list.

SAMPLE OF STRIP CHART PRINTOUT



DIAG. TROUBLE CODES
ECU: $10 (Engine)
Number of DTCs: 3
*P0118 Engine Coolant Temperature Circuit High Input
P0201 Injector Circuit Malfunction - Cylinder 1
ENTER = FREEZE FRAME

DIAGNOSTIC TROUBLE CODES (DTCs)

Press (2) to select <DTCs> from the <OBD II FUNCTIONS> menu. Diagnostic Trouble Codes are also referred to as OBD II Mode 3. The Tester reads all DTCs which have been saved by the vehicle's controllers and then displays the following:

- A list of the current DTCs and their descriptors.
- The ID of the ECU reporting them.
- Total number of codes being reported.

If the vehicle contains more than one OBD II ECU, select the primary ECU for the display of diagnostic information. Refer to Section *5.0 Displaying Data For Multiple ECUs on page 299*, for more information.

A "↓" in the upper right of the display indicates that there are more DTCs than can be displayed at one time. Use the △ and ▽ keys to scroll through the list of received Trouble Codes.

A "*" next to the Trouble Code ID indicates there is freeze frame data associated with that DTC. If freeze frame data is available for the highlighted DTC, press (ENTER) to display the <FREEZE DATA>. This is the same function as selecting <FREEZE DATA> from the <OBD II FUNCTIONS> menu.

ACTIVE KEYS

△ ▽	Move the highlight up or down. Scroll through all Trouble Codes.
(ENTER)	Display Freeze Data.

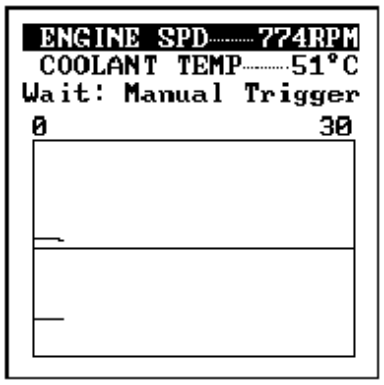
SNAPSHOT

Press (3) to select <SNAPSHOT> from the <OBD II FUNCTIONS> menu. The <SNAPSHOT> function captures vehicle parameters for later review. The <SNAPSHOT> function can be used to diagnose intermittent problems or capture data when a DTC is set.

<1: ANY DTC TRIGGER> Trigger data capture when any DTCs are set.
<2: SINGLE DTC TRIGGER> Trigger data capture when a particular DTC is set.
<3: MANUAL TRIGGER> Trigger data capture manually.
<4: SNAPSHOT REPLAY> Review stored data.
<5: TRIGGER POINT> Set Snapshot Trigger Point.

ACTIVE KEYS

△ ▽ Move the highlight up or down.
(1) - (5) Select function.
(ENTER) Select highlighted function.
(EXIT) Return to <OBD II FUNCTIONS> menu.



MANUAL SNAPSHOT

Press (3) to select <MANUAL SNAPSHOT> from the <SNAPSHOT> menu. The <MANUAL SNAPSHOT> function captures a snapshot of data. Select <ALL DATA> or <USER LIST> for the snapshot capture. Press (ENTER) to trigger the snapshot and begin capturing data.

DATA CAPTURE PHASE

The <LINE GRAPH> mode appears. Use the left and right keys to select the desired time scale for the snapshot. <Wait: Manual Trigger> is displayed on the screen until the snapshot is triggered. When a trigger occurs, <Trigger> is displayed while data is being saved.

ACTIVE KEYS

◁ ▷ Select snapshot capture time scale. Allowable time scales are 5, 10, 15, 30, 60, 100, 200, and 300 seconds.
△ ▽ Move the display up or down one parameter.
(✱) △ Move the display one page. (<DATA LIST> mode only.)
(✱) ▽
(YES) Change the highlighted parameter to the next parameter in the list. (<LED/LIST>, <BAR GRAPH>, <LINE GRAPH>, and <CUSTOM LIST> modes only.)
(NO) Change the highlighted parameter to the previous parameter in the list. (<LED/LIST>, <BAR GRAPH>, <LINE GRAPH>, and <CUSTOM LIST> modes only.)
(ENTER) Trigger the snapshot and terminates data capture.
(F1) Go to <DATA LIST> mode.
(F2) Go to <LED/LIST> mode.
(F3) Go to <BAR GRAPH> mode.
(F4) Go to <LINE GRAPH> mode.
(F5) Go to <CUSTOM LIST> mode.
(F9) Change between large and compressed character size.
(F0) Turn cursor on and off.
(✱)(HELP) Display parameter information.
(SEND) Print data list.

NOTE	Do not operate the keyboard while the Tester is saving vehicle data.

SNAPSHOT SAVE

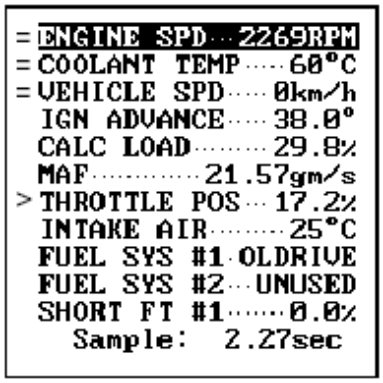
After completion of the data capture, the snapshot can be saved for later review.

Press (YES) to save this data set or (NO) to continue without saving the data. The current snapshot can be reviewed immediately even if not saved.

HINT	The snapshot data is stored on the Program Card. Make sure that the same Program Card is used when reviewing stored snapshot data.

ACTIVE KEYS

(YES) Save snapshot data.
(NO) Continue to Data Display phase without saving snapshot data.



DATA DISPLAY PHASE

At the completion of the data capture phase, <Sample> and a time stamp are displayed at the bottom of the screen. Data captured in the snapshot mode can be displayed in all of the formats that are available in the <DATA LIST> mode, except for Strip Chart.

ACTIVE KEYS

◁ ▷ Sequence through the sample displayed.

△ ▽ Move the display up or down one parameter.

✱ △ Move the display one page. (<DATA LIST> mode only.)

✱ ▽

YES Change the highlighted parameter to the next parameter in the list. (<LED/LIST>, <BAR GRAPH>, <LINE GRAPH>, and <CUSTOM LIST> modes only.)

NO Change the highlighted parameter to the previous parameter in the list. (<LED/LIST>, <BAR GRAPH>, <LINE GRAPH>, and <CUSTOM LIST> modes only.)

F1 Go to <DATA LIST> mode.

F2 Go to <LED/LIST> mode.

F3 Go to <BAR GRAPH> mode.

F4 Go to <LINE GRAPH> mode.

F5 Go to <CUSTOM LIST> mode.

F9 Change between large and compressed character size.

F0 Turn cursor on and off.

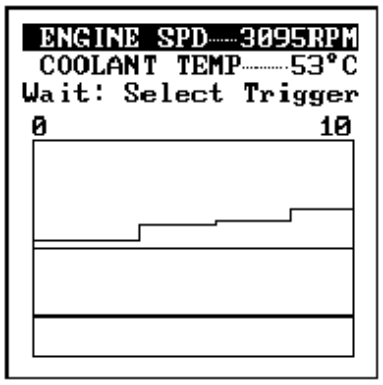
✱ ENTER Change ECU.

✱ HELP Display parameter information.

SEND Print data list.

ANY DTC TRIGGER

Press (1) to select <ANY DTC TRIGGER> from the <SNAPSHOT> menu. The <ANY DTC TRIGGER> function captures a snapshot of data after a Trouble Code is received. Select <ALL DATA>, <USER LIST>, or <CUSTOM DATA> list for the snapshot capture. The operation of <ANY DTC TRIGGER> is identical to <MANUAL SNAPSHOT> except the trigger occurs when any Trouble Code is set.



DATA CAPTURE PHASE

The <LINE GRAPH> mode appears. Use the left and right keys to select the desired time scale for the snapshot before trigger. Use the up and down keys to select a data parameter. <Wait: Select Trigger> is displayed until the snapshot is triggered. When a trigger occurs, <Trigger> is displayed while data is being saved.

ACTIVE KEYS

◁ ▷	Select snapshot capture time scale. Allowable time scales are 5, 10, 15, 30, 60, 100, 200, and 300 seconds.
△ ▽	Move the display up or down one parameter.
✱ △	Move the display one page. (<DATA LIST> mode only.)
✱ ▽	
YES	Change the highlighted parameter to the next parameter in the list. (<LED/LIST>, <BAR GRAPH>, <LINE GRAPH>, and <CUSTOM LIST> modes only.)
NO	Change the highlighted parameter to the previous parameter in the list. (<LED/LIST>, <BAR GRAPH>, <LINE GRAPH>, and <CUSTOM LIST> modes only.)
ENTER	Trigger the snapshot and terminates data capture.
F1	Go to <DATA LIST> mode.
F2	Go to <LED/LIST> mode.
F3	Go to <BAR GRAPH> mode.
F4	Go to <LINE GRAPH> mode.
F5	Go to <CUSTOM LIST> mode.
F9	Change between large and compressed character size.
F0	Turn cursor on and off.
✱ HELP	Display parameter information.
SEND	Print data list.

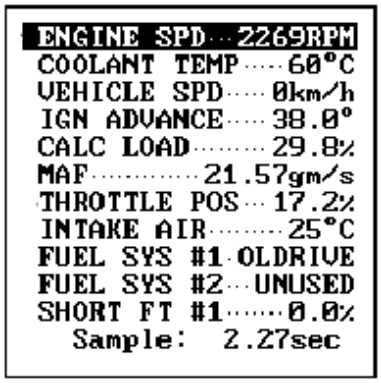
SNAPSHOT SAVE

After completion of the data capture, the snapshot can be saved for later review.

Press (YES) to save this data set or (NO) to continue without saving the data. The current snapshot can be reviewed immediately even if not saved.

ACTIVE KEYS

YES	Save snapshot data.
NO	Continue to Data Display phase without saving snapshot data.



DATA DISPLAY PHASE

At the completion of the data capture phase, <Sample> and a time stamp are displayed at the bottom of the screen. Data captured in the <SNAPSHOT> mode can be displayed in all of the formats that are available in the <DATA LIST> mode, except for Strip Chart.

ACTIVE KEYS

◁ ▷ Sequence through the sample displayed.

△ ▽ Move the display up or down one parameter.

✱ △ Move the display one page. (<DATA LIST> mode only.)

✱ ▽

YES Change the highlighted parameter to the next parameter in the list. (<LED/LIST>, <BAR GRAPH>, <LINE GRAPH>, and <CUSTOM LIST> modes only.)

NO Change the highlighted parameter to the previous parameter in the list. (<LED/LIST>, <BAR GRAPH>, <LINE GRAPH>, and <CUSTOM LIST> modes only.)

F1 Go to <DATA LIST> mode.

F2 Go to <LED/LIST> mode.

F3 Go to <BAR GRAPH> mode.

F4 Go to <LINE GRAPH> mode.

F5 Go to <CUSTOM LIST> mode.

F9 Change between large and compressed character size.

F0 Turn cursor on and off.

✱ ENTER Change ECU.

✱ HELP Display parameter information.

SEND Print data list.

REPLAY SNAPSHOT

Press (5) to select <REPLAY SNAPSHOT> from the <SNAPSHOT> menu.

ACTIVE KEYS

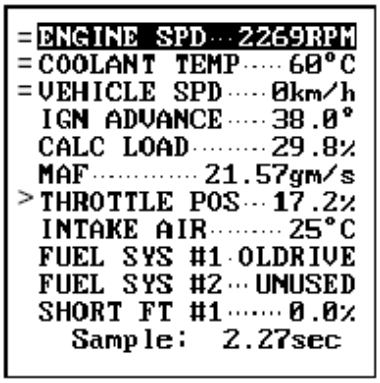
△ ▽ Move the cursor (highlight) up and down.
(ENTER) Displays the vehicle information of the selected snapshot data.
(✱)(ENTER) Deletes selected snapshot from the list.

The vehicle information of the selected snapshot data is displayed.

ACTIVE KEY

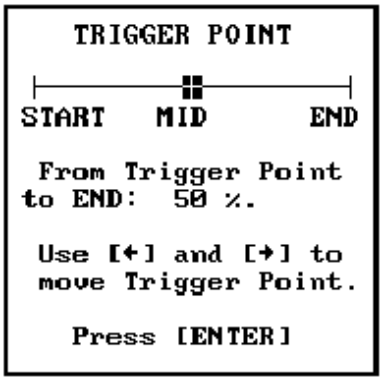
(ENTER) Displays selected snapshot data.

The data parameters which were captured during the event are displayed. The Data Display phase is indicated by <Sample> and a time stamp.



ACTIVE KEYS

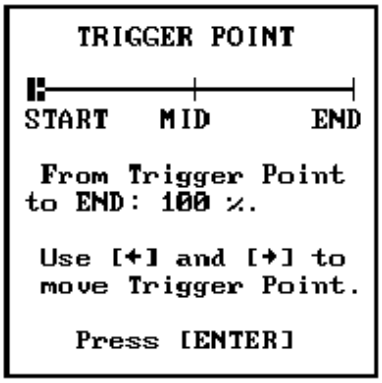
◁ ▷ Sequence through the sample displayed.
△ ▽ Move the display up or down one parameter.
(✱)△ Move the display one page. (<DATA LIST> mode only)
(✱)▽
(YES) Change the highlighted parameter to the next parameter in the list. (<LED/LIST>, <BAR GRAPH>, <LINE GRAPH>, and <CUSTOM LIST> modes only.)
(NO) Change the highlighted parameter to the previous parameter in the list. (<LED/LIST>, <BAR GRAPH>, <LINE GRAPH>, and <CUSTOM LIST> modes only.)
(F1) Go to <DATA LIST> mode.
(F2) Go to <LED/LIST> mode.
(F3) Go to <BAR GRAPH> mode.
(F4) Go to <LINE GRAPH> mode.
(F5) Go to <CUSTOM LIST> mode.
(F9) Change between large and compressed character size.
(F0) Turn cursor on and off.
(✱)(ENTER) Change ECU.
(✱)(HELP) Display parameter information.
(SEND) Print data list.



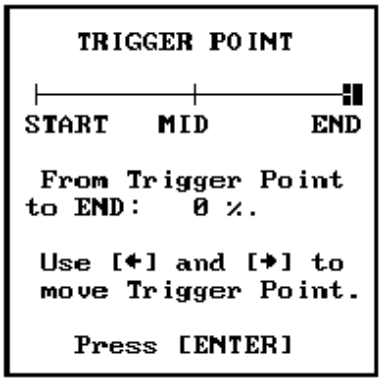
TRIGGER POINT

Press (5) to select <TRIGGER POINT> from the <SNAPSHOT> menu. <TRIGGER POINT> allows you to choose how much data to save after the trigger.

The display at the left stores 50% of the data before and 50% of the data after the trigger point.



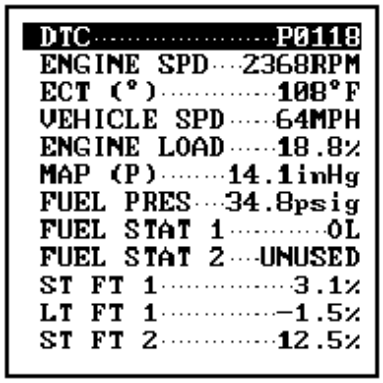
The display at the left stores 100% of the data after the trigger point.



The display at the left stores no data after the trigger point.

ACTIVE KEYS

◁ ▷ Move the trigger point marker left or right.
(ENTER) Confirm trigger point setting and return to the <CURRENT DATA> menu.



FREEZE DATA

Press (4) to select <FREEZE DATA> from the <OBD II FUNCTIONS> menu. The vehicle's ECU typically saves information about the state of the vehicle when a Diagnostic Trouble Code (DTC) occurs. Freeze data is also referred to as Freeze Frame Data and can be read by the Tester using the <FREEZE DATA> mode. You can select this mode from the <OBD II FUNCTIONS> menu or you can select it from the DTC display mode. (Refer to the <DTCs> description.) Freeze Data is also referred to as OBD II Mode 2.

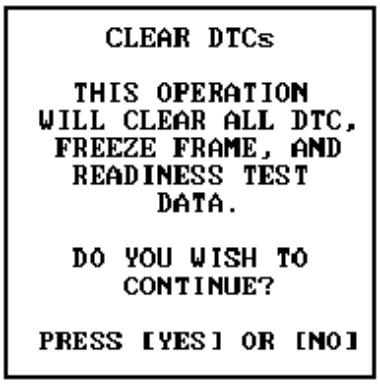
If the vehicle contains more than one OBD II ECU, select the primary ECU for the display of diagnostic information. Refer to Section 5.0: Displaying Data For Multiple ECUs for more information.

FREEZE DATA DISPLAY

Freeze Data is only available for the first DTC which was detected by the vehicle. The first parameter in the list is the DTC which caused the Freeze Data to be saved. The Freeze Data is displayed in the same format as the All Data List format described in the <DATA LIST> mode.

ACTIVE KEYS

△ ▽	Move marker up or down one parameter.
✱ △	Move the display one page (<DATA LIST> only).
✱ ▽	
F1	Go to <DATA LIST> mode.
F2	Go to <LED LIST> mode.
F3	Go to <BAR GRAPH> mode.
F9	Change character size.
F0	Turn cursor on/off.
SEND	Print data list.
✱ ENTER	Change the reporting ECU.



CLEAR DIAGNOSTIC INFORMATION

Press (5) to select <CLEAR DTCs> from the <OBD II FUNCTIONS> menu. The <CLEAR DIAGNOSTIC INFORMATION> mode is used to clear DTCs from all OBD II ECUs, along with any other diagnostic information which the controller has saved, such as Freeze Data.

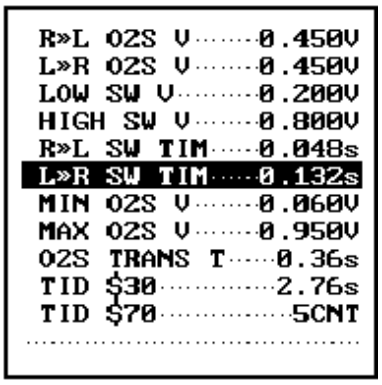
NOTE	Clearing diagnostic information also clears the status of readiness tests (making them incomplete). It can take 30 to 60 minutes to complete all of these tests after they are cleared. Some inspection and maintenance programs require that the readiness tests be complete before proceeding with the inspection.

THIS VEHICLE MAY NOT BE ABLE TO CLEAR DIAGNOSTIC INFORMATION WHILE ENGINE IS RUNNING.
PLEASE TURN ENGINE OFF AND TRY AGAIN WITH KEY ON, ENGINE OFF
Press [ENTER]

Some vehicles will not allow DTCs to be cleared while the engine is running. Turn off the engine, leaving the key in the ON position, before selecting this mode.

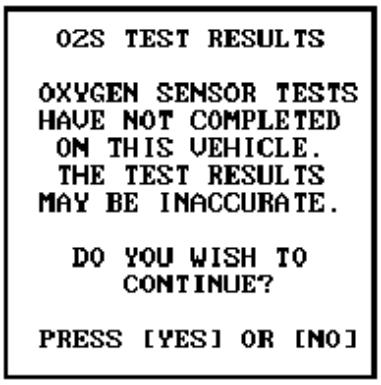
ACTIVE KEYS

(YES) Clear DTCs, Freeze Data and Readiness Tests results.
(NO) Return to <OBD II FUNCTIONS> menu.
(EXIT) Return to <OBD II FUNCTIONS> menu.

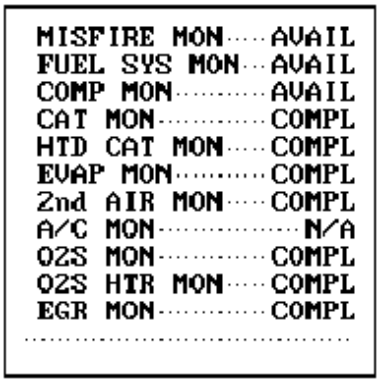


OXYGEN SENSOR MONITORING TEST RESULTS

Press (6) to select <O2S TEST RESULTS> from the <OBD II FUNCTIONS> menu. The Oxygen Sensor (O2S) Monitoring Test Results displays the results of the oxygen sensor testing performed by the vehicle's engine controller. O2S Test Results is also referred to as OBD II Mode 5. These tests are “once per trip” tests performed after the ignition is turned on and the vehicle is operated under conditions defined by the manufacturer. The <O2S Test Results> mode is not available for all vehicles. Some vehicles use the Non-Continuous Test Results mode to report results of O2S testing.



A warning message indicating that the <O2S TEST RESULTS> may be inaccurate means the vehicle ECU is reporting that O2S tests have not been completed. The status of the oxygen sensor tests can be monitored using <Readiness Tests>. For some vehicles, O2S test results may not be available until all Readiness Tests have been completed.



READINESS TESTS

Press (7) to select <READINESS TESTS> from the <OBD II FUNCTIONS> menu. The <READINESS TESTS> mode allows you to display the status of the vehicle's on-board monitors, which monitor the operation of the emissions-related components. These monitors must run in order for the DTC and test result displays to accurately reflect the condition of the vehicle's emissions-related components.

If the vehicle contains more than one OBD II ECU, select the primary ECU for the display of diagnostic information. Refer to Section *5.0 Displaying Data For Multiple ECUs on page 299* for more information.

The first three display items indicate the systems or components which are continuously monitored. If the Tester displays N/A (Not Available), the vehicle is not capable of continuously monitoring that system.

- Misfire monitoring
- Fuel system monitoring
- Comprehensive component monitoring

The other eight display items indicate the status of the tests which are performed “once per trip”:

- Catalyst monitoring
- Heated catalyst monitoring
- Evaporative system monitoring
- Secondary air system monitoring
- A/C system refrigerant monitoring
- Oxygen sensor monitoring
- Oxygen sensor heater monitoring
- EGR system monitoring

The systems or components listed above can be Completed (COMPL), Not Completed (INCMPL), or Not Available (N/A).

ACTIVE KEYS

△ ▽	Move marker up or down.
F1	Go to <DATA LIST> mode.
F3	Go to <LED/LIST> mode.
F9	Change character size.
F0	Turn cursor on/off.
EXIT	Return to menu.
SEND	Print data list.
✱ HELP	Display specifications for the highlighted parameter.
✱ ENTER	Change the reporting ECU.

ADVANCED OBD II FUNCTIONS

Press (9) to select <ADVANCED OBD II> from the <OBD II FUNCTIONS> menu. <ADVANCED OBD II> functions are operating modes which may not be supported on the vehicle. An <ADVANCED OBD II> menu is displayed, allowing you to choose between the <ON-BOARD TESTS> mode and the <EVAP LEAK TEST> mode.

ON-BOARD TESTS

Press (1) from <ADVANCED OBD II FUNCTIONS> menu to select <ON-BOARD TESTS>. The <ON-BOARD TESTS> mode provides the capability to examine the results of various additional tests performed by the vehicle's controller(s). These tests are specific to the vehicle manufacturer. The test results should be evaluated by referencing the vehicle service manual. Two types of on-board test monitoring are supported: Non-Continuous and Continuous.

NON-CONTINUOUS TEST RESULTS

Press (1) from the <ON-BOARD TESTS> menu to select <NON-CONTINUOUS TESTS>. <NON-CONTINUOUS TESTS> is similar to the <O2S Test Results>. Some manufacturers use this mode as an alternate for reporting O2 sensor test results. Non-Continuous Tests are also referred to as OBD II Mode 6.

If the vehicle contains more than one OBD II ECU, select the primary ECU for the display of diagnostic information. Refer to Section *5.0 Displaying Data For Multiple ECUs on page 299*, for more information.

In this mode the vehicle's controller reports data for various Test IDs (TIDs) and Component IDs (CIDs). In addition to reporting data for these TIDs and CIDs, the vehicle reports test limits (minimum, maximum, or both) for acceptable operation. The Tester compares the data with the test limits and displays a PASS or FAIL indication for each TID and CID. Please refer to the service manual for more information.

ACTIVE KEYS

△ ▽	Move marker up or down.
✱ △	Page up/down list.
✱ ▽	
9	Change character size.
0	Turn cursor on/off.
EXIT	Return to <ON-BOARD TESTS> menu.
SEND	Print data list.
✱ HELP	Display specifications for the highlighted parameter.
✱ ENTER	Change the reporting ECU.

CONTINUOUS TEST RESULTS

Press (2) from the <ON-BOARD TESTS> menu to select <CONTINUOUS TESTS>. The vehicle's controller performs analysis similar to that used to determine if the equivalent DTC is present, but with less stringent requirements. For example, a DTC may require a condition to be present for several drive cycles, while the equivalent continuous test code may be set with the first occurrence of the condition. Continuous Tests are also referred to as OBD II Mode 7.

Results of the continuous tests are displayed in a manner similar to the DTC display mode.

If the vehicle contains more than one OBD II ECU, select the primary ECU for the display of diagnostic information. Refer to Section Section *5.0 Displaying Data For Multiple ECUs on page 299*, for more information.

ACTIVE KEYS

△ ▽ Move to another test.
(✱) (ENTER) Change the reporting ECU.
(EXIT) Return to <ON-BOARD TESTS> menu.

EVAP LEAK TEST

Press (2) from <ADVANCED OBD II FUNCTIONS> menu to select <EVAP LEAK TEST>. The <EVAP LEAK TEST> function enables the conditions required to conduct an evaporative System Leak Test, but does not run the Test. Evaporative System Leak Test is referred to as OBD II Mode 8.

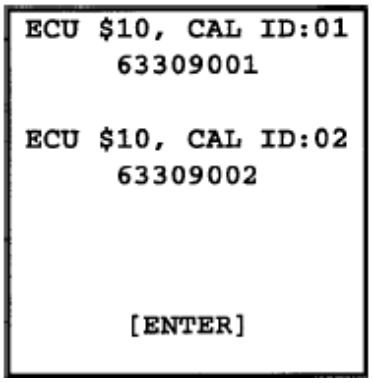
Press (ENTER) to perform the <EVAP LEAK TEST> function.

INFORMATION

Press (0) to select <INFORMATION> from the <OBD II FUNCTIONS> menu. <INFORMATION> functions are operating modes which may not be supported on the vehicle. An <INFORMATION> menu is displayed, allowing you to choose between the <VIN> mode, the <CALIBRATION ID> mode, and the <CAL VERIFICATION> mode. Vehicle Information is also referred to as OBD II Mode 9.

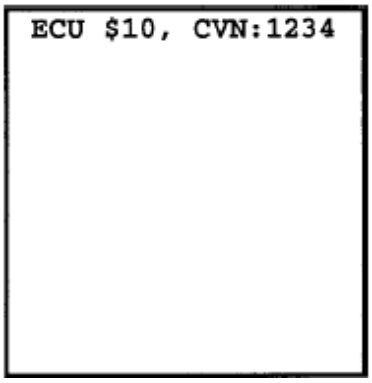
VIN

Press (1) from <INFORMATION MENU> to select <VIN>. The vehicle ID is displayed.



CALIBRATION ID

Press (2) from <INFORMATION MENU> to select <CALIBRATION ID>. The calibration ID's are displayed.



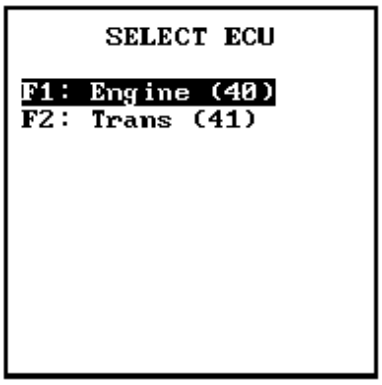
CAL VERIFICATION

Press (3) from <INFORMATION MENU> to select <CAL VERIFICATION>. The calibration verification values are displayed.

5.0 DISPLAYING DATA FOR MULTIPLE ECUS

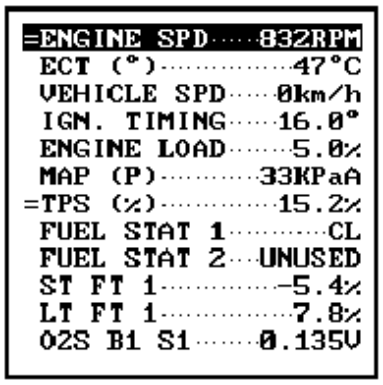
In some vehicles OBD II information is sent to the Tester by more than one ECU. For example, a vehicle may have both an engine controller and a transmission controller which can provide emissions-related diagnostic data.

When the Tester initiates communication with an OBD II vehicle, it determines which ECUs are available on the vehicle. If more than one OBD II ECU is present, the Tester displays a message indicating the IDs for each ECU along with the type of ECU (e.g., engine or transmission).



In most of the OBD II test modes, when more than one ECU is communicating, select the ECU for which you want to examine data. This selection is provided for the following modes:

- DATA LIST
- DTCs
- FREEZE DATA
- SNAPSHOT
- READINESS TESTS
- ON-BOARD TESTS



For DTCs, Freeze Data, and Readiness Tests, this selection determines which ECU's data is displayed.

For <DATA LIST> and <SNAPSHOT> modes, the Tester displays a composite list of data received from all ECUs. Selecting an ECU before entering the mode determines which ECU's data is displayed first for parameters that are reported by more than one ECU.

Pressing ✱ HELP displays information about the highlighted parameter, including which ECU reported it. If more than one ECU reported a parameter, you can change the ECU data displayed by pressing ✱ ENTER. This allows you to compare the data reported by two or more ECUs. The ✱ ENTER only affects the display for the highlighted parameter. The total list of parameters is a composite of parameters reported by all ECUs. It is possible to have a mix of parameters, some of which are reported only by the engine controller, some reported only by the transmission controller and some reported by both. You can verify the reporting ECU by pressing ✱ HELP.

MULTIPLE ECU STATUS INFORMATION

When viewing multiple OBD II ECU diagnostic data parameters, the symbol "=" or ">" before the parameter name indicates the parameter is being updated by multiple ECUs. The "=" symbol indicates the displayed parameter value is being reported as the same value by multiple ECUs. The ">" symbol indicates the displayed parameter value is not being reported as the same value by multiple ECUs. If there is no symbol before the parameter name, the parameter is being updated by a single ECU.

CHARACTER	STATUS
=	Indicates multiple controllers are reporting approximately the same value for the parameter.
>	Indicates multiple controllers are reporting different values for the parameter.

The following table lists the tolerances for the different parameters being labeled "=" or ">". Multiple parameters that are within the tolerances are reported as being the same. Multiple parameters that are not within the tolerances are reported as being not the same.

PARAMETER	TOLERANCE
Engine Load	1.96%
ECT	5 °C
ST FT 1/ ST FT 2	3.91 %
LT FT 1/ LT FT 2	3.91 %
Fuel Pressure	15 kPaG
MAP	5 kPa
Engine Spd	2.5 RPM
Vehicle Spd	5 kph
Ign. Timing	2.5°
IAT	5 °C
MAF	0.1 gm/s
TPS	1.96%
O2S Bx Sx	0.025 V
FT O2S Bx Sx	3.91%

Bx = Bank number
Sx = Sensor number

1.0 INTRODUCTION

CUSTOMIZE FUNCTION DESCRIPTION

The Customize function enables you to change the specifications in accordance with the various electrical systems of the vehicles. Using the Customize function with the Tester enables you to change specifications easily and quickly to comply with the customer's demands.

NECESSARY ITEMS FOR CUSTOMIZATION

The following Diagnostic Toolset equipment is required to perform the customization:

For US Spec. Vehicles	For Europe and General Spec. Vehicles
• Tester • DLC Cable • CAN Module • Diagnosis Program Card	• Tester • DLC Cable • DLC3 (M-OBD) Cable • VIM • Diagnosis Program Card

2.0 OPERATING PRECAUTIONS

CAUTION!	**FOR SAFETY REASONS OBSERVE THE FOLLOWING:** • When performing any checks with the engine running in an enclosed space such as a garage, be sure there is proper ventilation. Never inhale exhaust gases; they contain carbon monoxide, a colorless, odorless, extremely dangerous gas which can cause unconsciousness or death. • Be sure to safely route all cables when driving with the Tester connected to the vehicle (i.e., keep cables away from feet, pedals, steering wheel and shift lever). • Two persons are required when test driving with the Tester: one person to drive the vehicle, and one person to operate the Tester.

NOTE	• Do not remove or install a program card or cartridge while power is applied to the Tester. If you wish to change or add a program card or cartridge, first turn the Tester off by pressing (#)(EXIT).

3.0 BASIC OPERATING PROCEDURE

For a detailed operating procedure for each system, please refer to the SERVICE BULLETIN from Toyota Motor Corporation.

TESTER SETUP

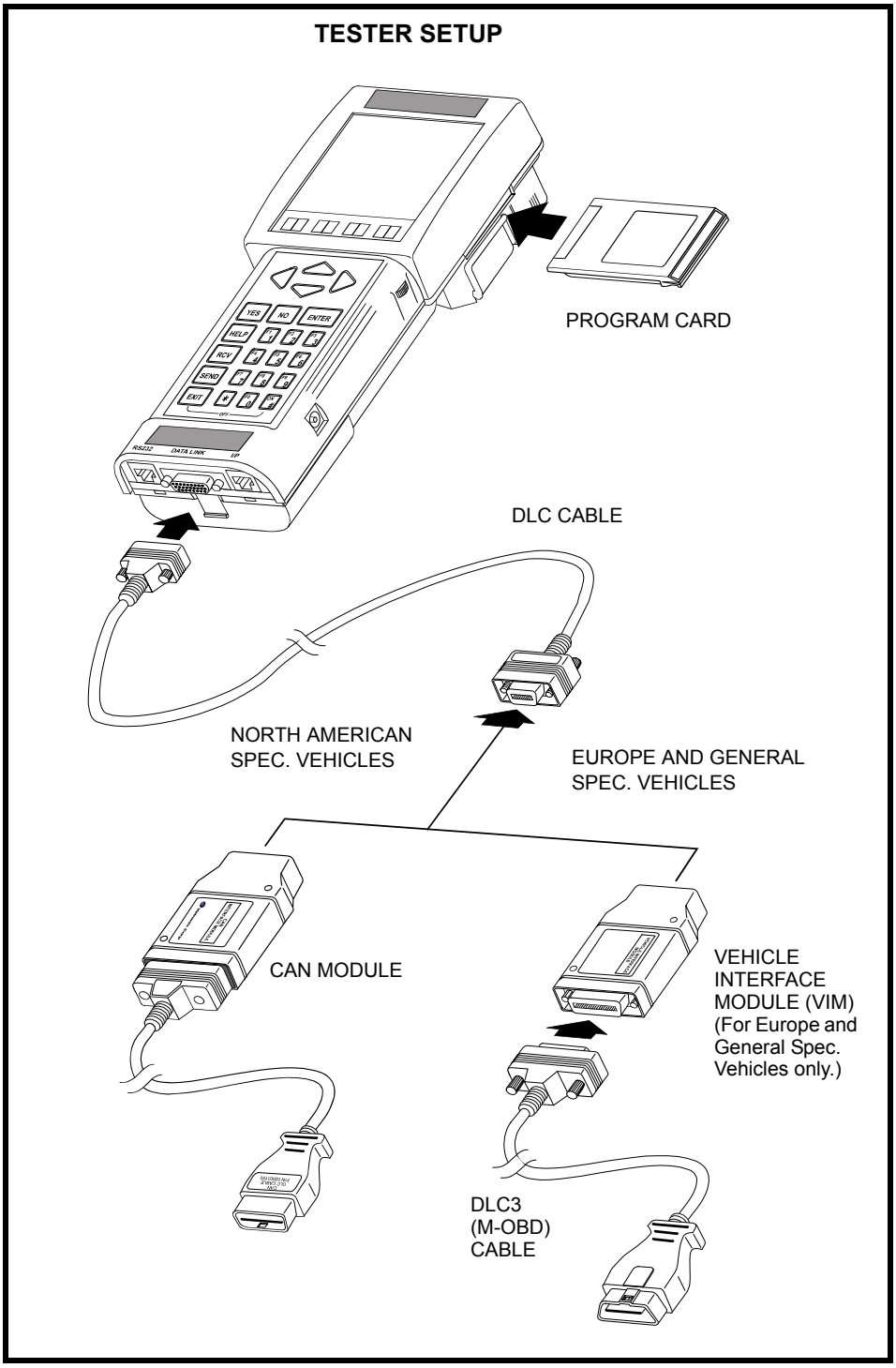
Before using the customization functions of the Program Card, the following steps must be performed. Refer to the illustration on the following page.

1. Insert the Diagnosis Program Card into the Tester. Hold the card so the label is toward the face of the Tester, then insert the card firmly into the slot located on the upper right side. The slot is keyed so the card can only be installed one way; don't force it if the card doesn't slide easily. When removing the program card, pull it straight out of the Tester without rocking it up and down.
2. Connect the DLC cable to the Tester. Connect the 26-pin end of the cable to the bottom of the Tester, and then tighten the screws.

3a. **For North American Spec. Vehicles**: connect the CAN Module to the DLC cable, then tighten the screws.

3b. **For Europe and General Spec. Vehicles**: connect the Vehicle Interface Module (VIM) to the DLC cable. Connect the DLC3 (M-OBD) cable to the VIM, then tighten the screws.

4. Connect the CAN Module to the vehicle DLC3. The vehicle DLC3 is located under the dash on the driver's side of the vehicle. The vehicle's DLC3 connector may be behind a protective cover.
5. The Tester is powered directly through the DLC3 cable. Press (ON) to turn on the Tester.
6. Turn the Vehicle Ignition to ON.


TESTER SETUP
PROGRAM CARD
DLC CABLE
NORTH AMERICAN
SPEC. VEHICLES
EUROPE AND GENERAL
SPEC. VEHICLES
CAN MODULE
VEHICLE
INTERFACE
MODULE (VIM)
(For Europe and
General Spec.
Vehicles only.)
DLC3
(M-OBD)
CABLE

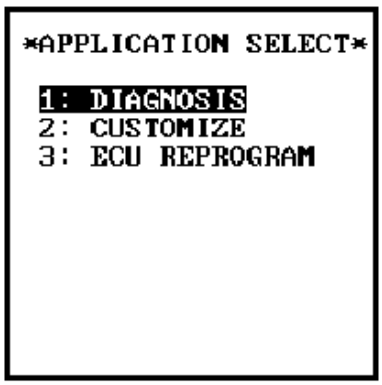
STARTUP

POWER-UP

The program card identification screen is displayed when the Tester is powered up. Press (ENTER) to continue.

ACTIVE KEY

(ENTER) Proceed to the <MAIN MENU>.



To access the Customized function, press (2).

SELECTING THE VEHICLE

This screen is only displayed if a vehicle has previously been selected.

From the Vehicle Select menu you can select a new vehicle to test or select the last vehicle that was tested. Use the △ and ▽ keys to select <NEW VEHICLE> or <LAST VEHICLE>, then press (ENTER).

NEW VEHICLE: Select a new vehicle from the vehicle select displays.
LAST VEHICLE: The selection criteria used to select the previous vehicle are displayed. Press (ENTER) to proceed to the OBD Menu.

ACTIVE KEYS

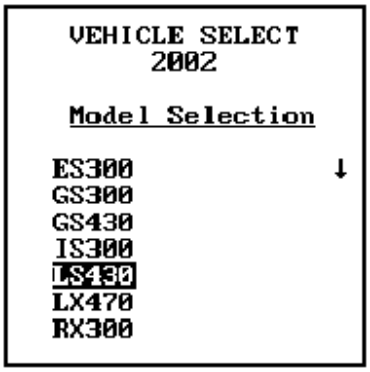
△ ▽ Move highlighted cursor between <NEW VEHICLE> or <LAST VEHICLE>.
(ENTER) Select the highlighted menu item: either new vehicle or last vehicle.
(EXIT) Return to Main Menu.

MODEL YEAR SELECTION SCREEN

The available model years are displayed. Use the △ and ▽ keys to move the cursor between options, then press (ENTER) to continue.

ACTIVE KEYS

△ ▽ Move highlighted cursor between menu options.
(ENTER) Select Model Year.
(EXIT) Return to Vehicle Select screen.



MODEL SELECTION SCREEN

All body types available for the selected brand are displayed. Use the △ and ▽ keys to select the type of vehicle you are testing, then press (ENTER) to continue.

ACTIVE KEYS

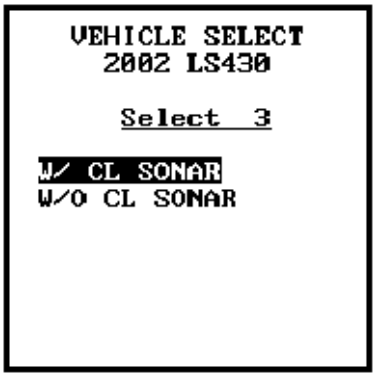
△ ▽ Move highlighted cursor between menu options.
(✱)△ Move the display one page.
(✱)▽
(ENTER) Select vehicle type.
(EXIT) Return to New Vehicle/Last Vehicle screen.

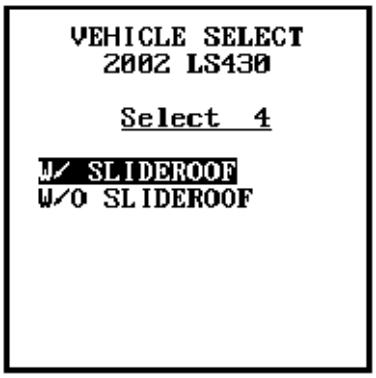
VEHICLE SELECT SCREEN(S)

In some cases further vehicle identification is required. Up to five select screens may be displayed to select a particular vehicle. Use the △ and ▽ keys to move the cursor between options, then press (ENTER) to select the option.

ACTIVE KEYS

△ ▽ Move highlighted cursor between options.
(ENTER) Select highlighted menu option.
(EXIT) Return to previous screen.



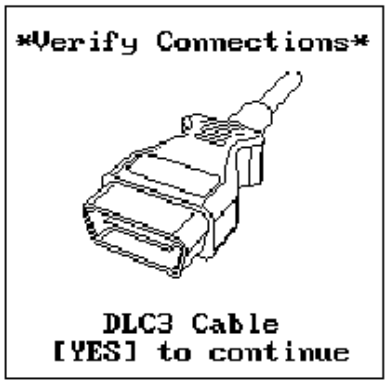


VEHICLE CONFIRMATION SCREEN

When all of the requested information has been entered, a summary screen of the vehicle configuration is displayed. If the information does not match the vehicle, press (EXIT) to review the previously displayed screens. Correct the information, then proceed through the vehicle selection process again. If the information matches the vehicle you are testing, press (YES) and the <OBD MENU> is displayed. The number in the right column is the unique vehicle reference number.

ACTIVE KEYS

(YES) Confirm systems selected.
(EXIT) Return to Vehicle Select displays.



CONNECTION VERIFICATION

Verify that the connector displayed on the Tester is properly connected to the vehicle.

ACTIVE KEYS

(YES) Proceed with Customize function.
(EXIT) Return to menu.

SELECTING A FUNCTION

All functions available on the Program Card are displayed. Press the key corresponding to the number next to the desired function.

<1: INDIVIDUAL CHANGE>Change Vehicle Settings.
<2: ALL ORIG SETTINGS> Reset customizable settings to original settings.

ACTIVE KEYS

△ ▽ Change highlighted menu item.
(1), (2) Select Menu Item
(ENTER) Select highlighted menu item.
(EXIT) Return to the Power-up screen.

INDIVIDUAL CHANGE

Press (1) from the <CUSTOMIZE MENU> to select the Individual Change function. The Individual Change function allows you to change the setting for a wide range of systems and functions.

NOTICE
Record the current value before changing.
Confirm the item availability from publications prior to selecting and changing.
PRESS [ENTER]

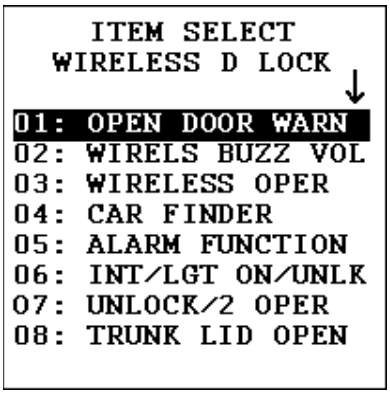
GROUP SELECTION

The Individual Change settings are divided into several functional groups, such as Security, Warning, etc. Choose the functional group to customize.

Press the number key corresponding to the desired selection, or use the △ ▽ keys to move the highlight to the desired selection and then press (ENTER). Remember that there may be more items than can be displayed on the screen at one time. Look for the ↑ or ↓ in the upper right corner of the display. The arrows indicate that more selections are available. Use the △ ▽ keys to display the additional selection items, or use the (✱)△, (✱)▽ to move the display a full page.

ACTIVE KEYS

△ ▽	Change highlighted menu item.
(✱)▽	Change to next page.
(✱)△	Change to previous page.
(0) - (9)	Select Menu Item.
(ENTER)	Select highlighted menu item.
(EXIT)	Return to the previous screen.



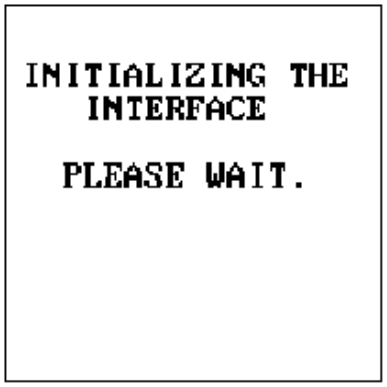
ITEM SELECTION

For each of the functional groups, several specific items can be customized. Choose the item to be changed.

Press the number key corresponding to the desired selection, or use the △ ▽ keys to move the highlight to the desired selection and then press (ENTER). Remember that there may be more items than can be displayed on the screen at one time. Look for the ↑ or ↓ in the upper right corner of the display. The arrows indicate that more selections are available. Use the △ ▽ keys to display the additional selection items, or use the (✱)△, (✱)▽ to move the display a full page.

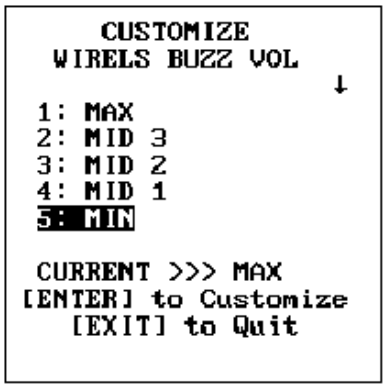
ACTIVE KEYS

△ ▽	Change highlighted menu item.
(✱)▽	Change to next page.
(✱)△	Change to previous page.
(1) - (8)	Select Menu Item.
(ENTER)	Select highlighted menu item.
(EXIT)	Return to the previous screen.



VEHICLE COMMUNICATION

After the item to be changed is selected, the Tester initiates communication with the vehicle in order to retrieve the current setting. Please wait until the communication is complete. If the Tester fails to communicate with the vehicle, check all connections between the vehicle and the Tester and verify that the ignition is in the ON position.



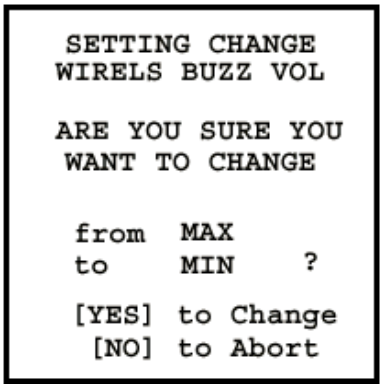
SETTING SELECTION

All of the available settings for the selected item are displayed. The current setting is displayed at the bottom of the screen. Choose the desired setting.

Press the number key corresponding to the desired selection, or use the △ ▽ keys to move the highlight to the desired selection and then press (ENTER). Remember that there may be more items than can be displayed on the screen at one time. Look for the ↑ or ↓ in the upper right corner of the display. The arrows indicate that more selections are available. Use the △ ▽ keys to display the additional selection items, or use the (✱)△, (✱)▽ to move the display a full page.

ACTIVE KEYS

△ ▽	Change highlighted menu item.
(✱)▽	Change to next page.
(✱)△	Change to previous page.
(1) - (5)	Select Menu Item.
(ENTER)	Select highlighted menu item.
(EXIT)	Return to the previous screen.



CONFIRMATION

Confirm that the desired setting is correctly chosen. Press (YES) to continue with the setting change, or (NO) to go back to SETTING SELECTION.

ACTIVE KEYS

(YES) Change Setting.
(NO) Choose a different item to customize.

VEHICLE COMMUNICATION

The Tester initiates communication with the vehicle again in order to make the desired change. Please wait until the communication is complete.

CUSTOMIZE SUCCESSFUL

If the customization is successful, the Tester displays this screen. Verify that the vehicle setting is in the desired state.

ALL ORIG SETTINGS
This function resets all items to their original settings.
It takes about two minutes to complete.
[ENTER] to Continue
[EXIT] to Quit

ALL ORIGINAL SETTINGS

Press (2) from the <CUSTOMIZE> menu to select the All Original Settings function. The All Original Settings function resets all customizable items to their original factory settings.

RECONFIRM SELECTED VEHICLE

Confirm that the selected vehicle is correct. Press (ENTER) to continue with restoring the settings, or (EXIT) to go leave the current (customized) settings.

ACTIVE KEYS

(ENTER) Continue resetting original settings.
(EXIT) Leave the current (cusomized) settings.

CUSTOMIZING ITEMS

The tester displays the progress of customizing, counting the systems as it finishes each one.

ALL ORIGINAL SETTINGS COMPLETED

FINISHING UP

When all items have been properly set, follow these steps to disconnect the Tester from the vehicle:

1. Turn the Tester OFF by pressing (#)(EXIT).
2. Turn the vehicle Ignition to OFF and remove the key.
3. Disconnect the DLC3 Cable from the Vehicle.

4a. **For North American Spec. Vehicles:** Disconnect the cables from the Tester.

4b. **For Europe and General Spec. Vehicles:** Disconnect the cables from the Tester and VIM.

5. Remove the program card from the Tester. Pull the card straight out of the Tester without rocking it up and down.

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1.0 OPERATING PRECAUTIONS

When operating your diagnostic equipment, always follow these basic safety precautions.

1. Read the instructions in this manual before using the PXA-1000 for the first time.
2. Exhaust gas contains invisible, colorless and odorless poisons. Always vent the vehicle exhaust and exhaust hoses of the Gas Analyzer to the outside and operate in a properly ventilated area. This applies to all calibration procedures, as well as to normal exhaust sampling.
3. It is important that the exhaust coming from the Gas Analyzer be treated the same as the exhaust coming out of the vehicle's tailpipe. Therefore, proper routing of the hoses is required for ventilation of the exhaust and drain hoses.
4. Keep all equipment clear of any moving parts. Follow standard shop safety precautions, including use of adequate eye protection.
5. Care should be exercised when handling hot exhaust sampling probes to prevent burns.
6. Do not operate a unit with a damaged power cable, or if the unit has been dropped or damaged, until it has been examined by a qualified service person.
7. This equipment has the potential for internal arcing or sparking and should not be exposed to flammable vapors. To reduce the risk of explosion, it should be operated in a well-ventilated area and at least 18 inches above the floor.
8. For safety, a separate driver and operator are necessary when gas analysis is being performed during road testing.
9. Do not expose the equipment to water or other liquids.

In addition to the basic safety precautions, certain steps should be followed to assure equipment accuracy and maintain warranty protection.

1. Perform proper filter inspections and replacements. Operation of the analyzer without filters or with excessively dirty filters can adversely impact performance and void your warranty.
2. Always operate the analyzer with the drain check valve clean and installed. Fluid contamination of the analyzer is not covered under your warranty.
3. Do not allow liquids to be sucked into the sample probe.
4. Gas analyzer accuracy will be adversely impacted if the analyzer is operated in below-freezing or excessively hot conditions. See **Appendix E Technical Specifications on page 366** for more information.

2.0 PXA-1000 GAS ANALYZER DESCRIPTION

The PXA-1000 is a portable, lightweight diagnostic and repair-grade precision instrument. It is designed to measure the concentrations of five exhaust gases for driveability diagnostics and enhanced emissions diagnosis and repair. It is capable of sampling and analyzing exhaust gases with performance that meets or exceeds BAR90 and OIML Class 1 standards. The Gas Measurement Bench utilizes the latest technology, requiring no moving parts.

A list of replacement parts can be found in Appendix C Gas Analyzer Spare Parts Chart on page 364.

FEATURES OF THE PXA-1000 GAS ANALYZER

The PXA series has a fully transportable design—ideal for use in the service bay or on the highway.

- Weighing about 12 pounds, the PXA-1000 is the most versatile Gas Analyzer on the market.
- The PXA-1000 is transportable to suit your diagnostic needs: on-board in the vehicle for test drives, or in the service bay with or without a dynamometer.
- The PXA-1000 is designed specifically to provide technicians with ease of operation—from fast setup to quick-disconnect plumbing and power cable.
- The modular construction means that the PXA-1000 can be easily upgraded, allowing for future expandability.

Builds on the Toyota Diagnostic Tester for emission system diagnosis.

- The PXA-1000 utilizes the Tester's screen to display gas data in text, bar chart, or line chart formats. Gas data can be displayed at the same time as vehicle data.
- The Tester captures snapshots of both tailpipe exhaust gas from the PXA-1000 and vehicle data in vehicles with serial data capability.

Anticipates demands *and* challenges of today's service technicians.

- Includes an on-line glossary of emissions-related technical, engineering, and diagnostic nomenclature for quick reference at any time.
- Offers comprehensive vehicle exhaust gas and vehicle serial data combined in one data list, allowing you to view vehicle data during periods of high emissions. This feature is especially useful during road testing.
- Procedures, software, and equipment have been rigorously tested and validated by technicians in "real world" automotive service environments.

INFORMATION ON GAS ANALYZER

NOx Sensor Cover

- Removal of cover provides access to NOx measurement device.

12V DC Power Cable Input

- Used when power is supplied from vehicle cigarette lighter or other 12-volt power source.

Tailpipe Exhaust Sample Input

- Inlet fitting for the 25-foot sample exhaust hose that connects to the vehicle tailpipe.

Exhaust Outputs

- Measured sample exhaust exits from the internal PXA-1000 bench through these ports.

Drain Filter

- Condensed exhaust water from the vehicle tailpipe is separated by the PXA-1000 and expelled from the analyzer through this port.

Calibration Gas Input

- Inlet port for calibration gas. Used during routine PXA-1000 calibration.

Instrumentation Ports

- I/P ports used for interface with the Tester and other I/P devices. The two ports can be used either simultaneously or independently, and support future expansion options.

RS-232 Port

- RS-232 port connects to PC to support PXA-1000 to PC communication. It is reserved for future use.

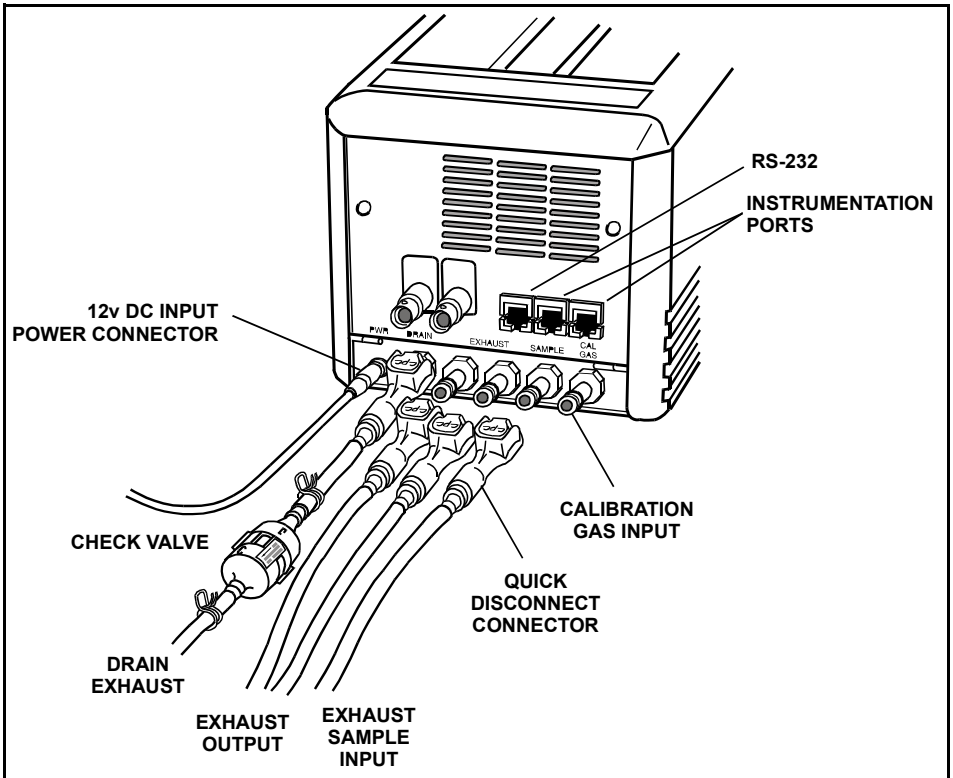


FIGURE 1. PXA-1000 Gas Analyzer

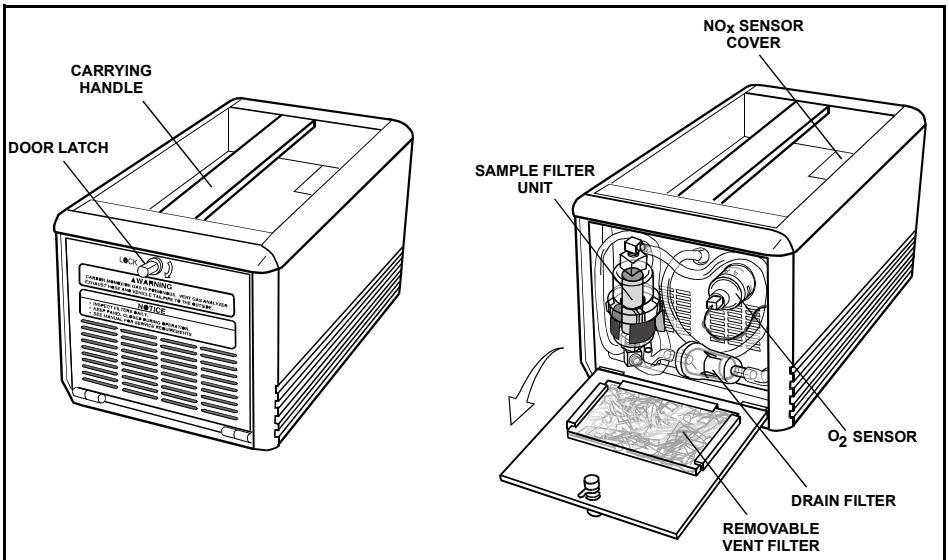


FIGURE 2. PXA-1000 Gas Analyzer

3.0 SETTING UP THE EQUIPMENT

EQUIPMENT SETUP FOR SERVICE BAY TESTING

Equipment List

Before operating the PXA-1000 using your Diagnostic Tester and to ensure proper operation, make sure the following components are available:

- Diagnostic Tester
- PXA-1000 Gas Analyzer
- PXA-1000 analyzer hoses and probe assembly
- DLC cable (for vehicle serial data)
- Integrated power and I/P cable
- Program card
- VP-411 printer (optional)
- AC/DC power supply (optional)

CAUTION!

Route all cables and connectors away from hot exhaust manifolds or tailpipes to avoid melting wires and connectors.

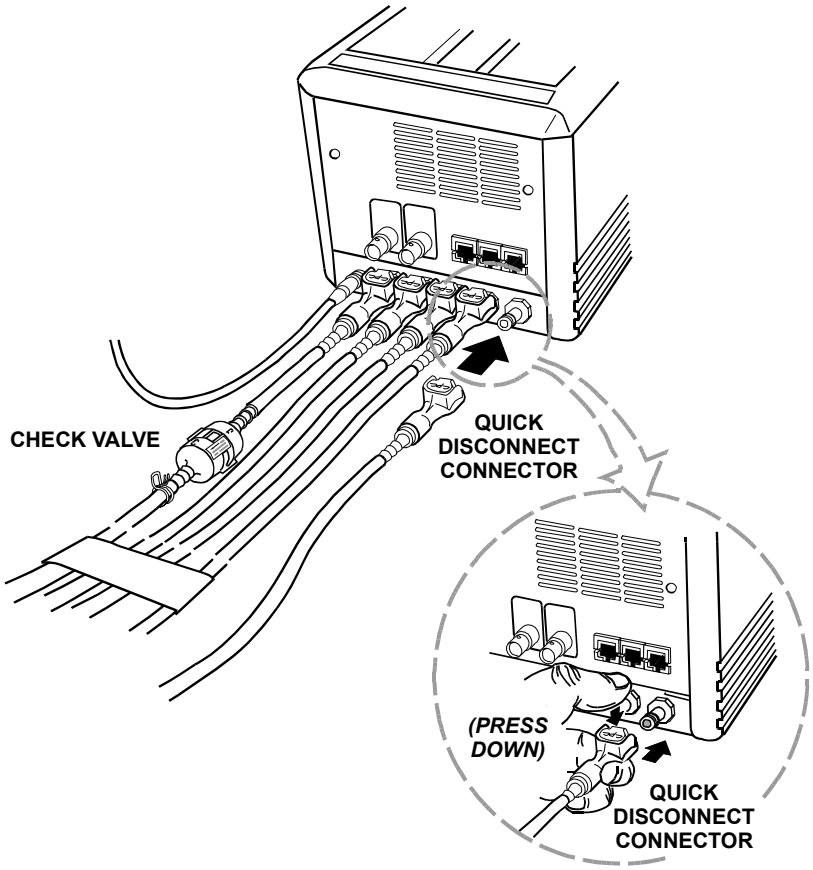


FIGURE 3. Quick-Disconnect Connector

To set up the PXA-1000 and Tester, do the following:

1.Locate a place to operate the PXA-1000 and Tester.

Locate a convenient place to put your analyzer that is out of your path for accessing the vehicle. Verify that the hoses will reach the tailpipe of the vehicle as well as allow you to control the PXA-1000 with your Tester. Consideration also must be made for location of the power source.

2.Connect the sampling hoses to the PXA-1000.

The sampling hoses are equipped with white “quick-disconnect” connectors to allow you to easily connect and disconnect the hoses from the PXA-1000. Each port on the analyzer is labeled to match the labels on the hose assembly for simple hookup locations.

3.Supply power to the PXA-1000.

Begin by supplying power to both the Gas Analyzer and the Tester. It is important that you choose a power source that is best suited for your testing needs. The power cable supplied with the Gas Analyzer plugs into several possible power sources using the proper adapters. Following is a list of possible sources of power that you may use to supply power to your Gas Analyzer and Tester.

3a. Vehicle Cigarette Lighter

You may use the Y-adapter cable with this power source. This will allow you to power the Tester and PXA-1000 using one power source.

NOTE	12 volts will not be available at the cigarette lighter when the vehicle's ignition key is turned off or during cranking. For this reason, you may choose to connect directly to the battery or simply make sure the key is on during Gas Analyzer warm-up through the end of the test. Failure to do so may cause the analyzer to reinitialize and go through its complete warm-up cycle.

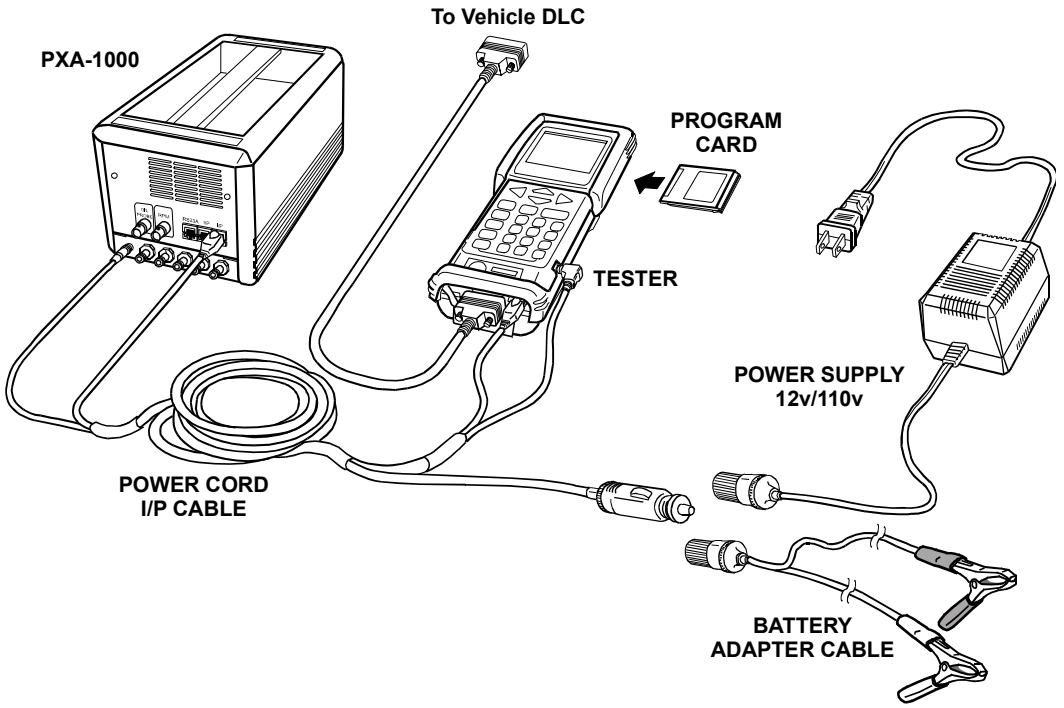


FIGURE 4. Equipment Setup for Service Bay Testing

3b. Direct Battery Connection

The battery clips allow direct connection to the vehicle's battery for supplying power to the PXA-1000. This type of power source eliminates problems that may occur when using the cigarette lighter, such as momentary loss of power.

NOTE	Always observe proper polarity (+/-) when connecting directly to the battery.

3c. AC/DC Power Supply (Optional)

For service bay testing you may want to use this reliable source of power to operate the analyzer. The AC/DC power supply comes with a cigarette-lighter jack that will accommodate either a Y-adapter for supplying power to both the Tester and PXA-1000 or the power cable supplied with the Gas Analyzer.

4. Insert the probe 12" into the tailpipe of the vehicle.

   Insert the end of the sampling probe a minimum of 12" into the tailpipe of the vehicle. The sampling probe comes with two types of retainers to ensure that the probe stays inside the tailpipe during use.

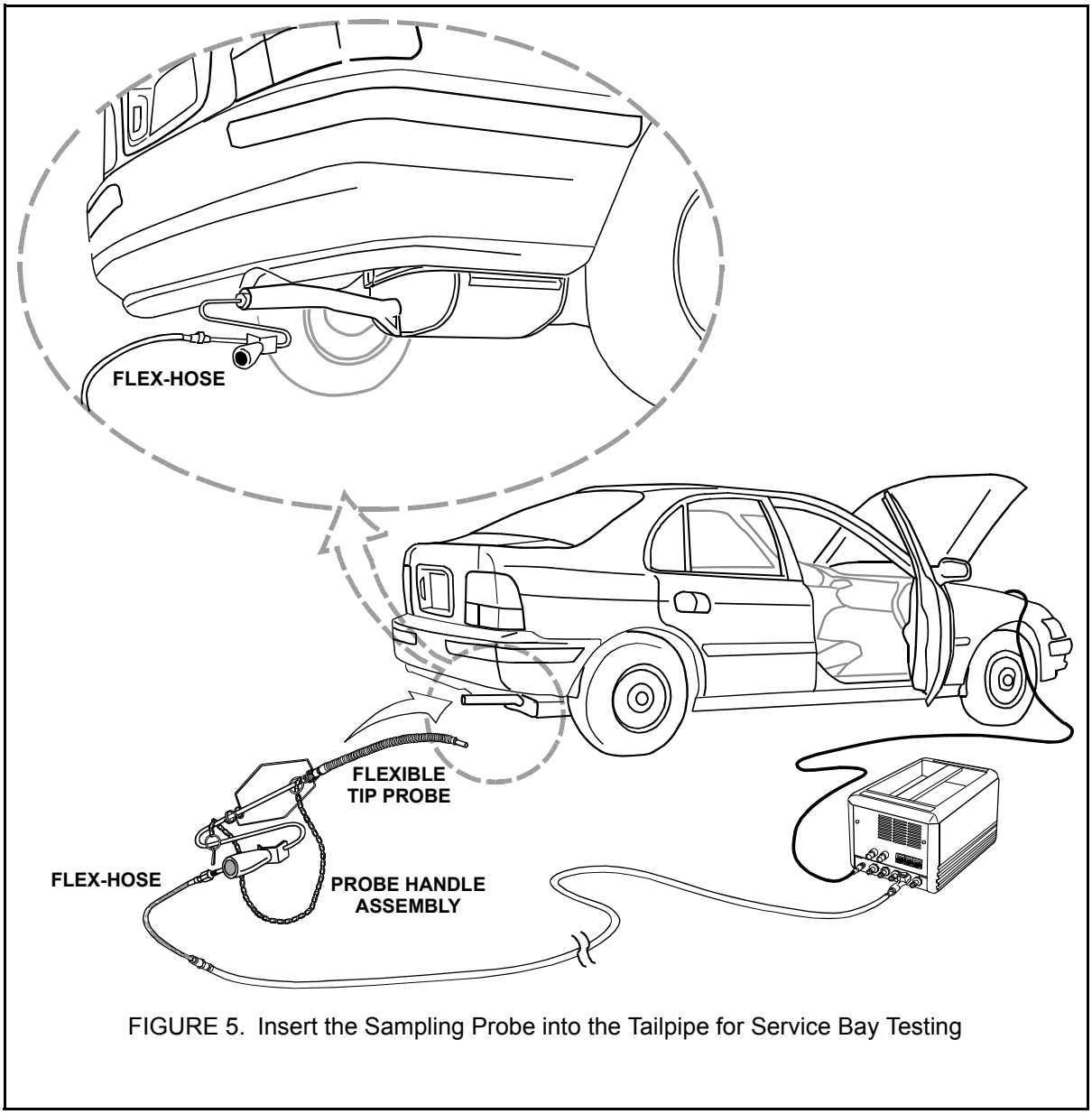


FIGURE 5. Insert the Sampling Probe into the Tailpipe for Service Bay Testing

5. Route the exhaust and drain hoses to proper ventilation.

   Once the analyzer samples the gas, it passes the sample through the exhaust and drain hoses of the analyzer sampling hose assembly. It is important that this exhaust is treated the same as the exhaust coming out of the vehicle's tailpipe. Therefore, proper routing of the hoses is required for ventilation of the exhaust and drain hoses.

WARNING!

Carbon monoxide gas is poisonous. Vent Gas Analyzer exhaust hose and vehicle tailpipe to the outside.

6. Install program card.

   The software that operates the Gas Analyzer, as well as all of the Tester features, is contained in the program card. With the Tester powered off, insert the program card into the program card slot of your tester.

7. Connect the PXA-1000 to the Tester using the I/P cable.

   The Tester controls the PXA-1000 by communicating through the I/P cable. Connect one end of the I/P cable to the Tester's I/P port and the other end to the analyzer's I/P port.

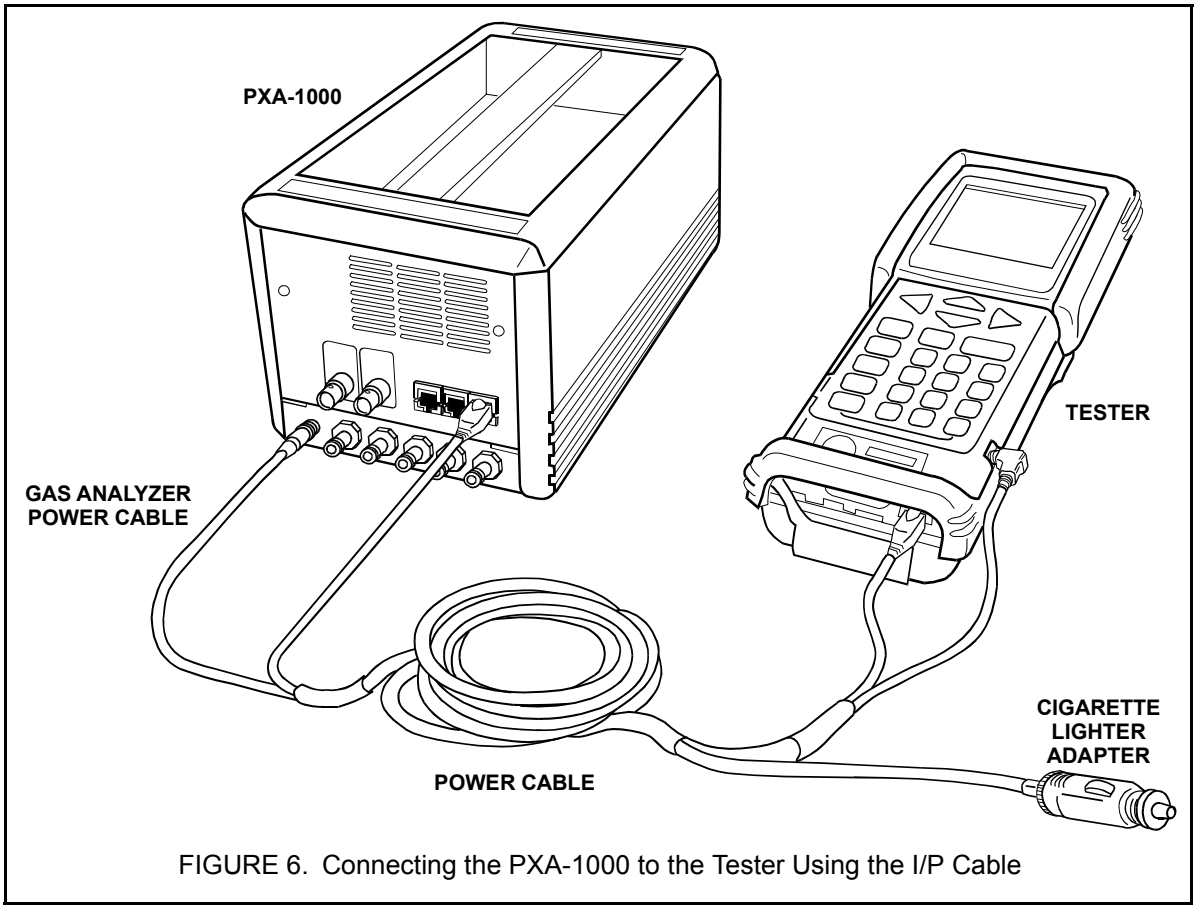


FIGURE 6. Connecting the PXA-1000 to the Tester Using the I/P Cable

8. Connect the DLC cable.

   Refer to the appropriate chapter (OBD, OBD-II) for instructions on connecting the Tester DLC cable to a vehicle.

9. Turn on the Tester.

   The Tester is now ready to control the Gas Analyzer. By pressing the (ON) key, the Tester will display the power-up screen. See Section 5.0: Gas Analysis Mode for Gas Analyzer operation.

EQUIPMENT SETUP FOR ROAD TEST

Equipment List

Before operating the PXA-1000 using your Tester and to ensure proper operation, make sure the following components are provided:

- Diagnostic Tester
- PXA-1000 Gas Analyzer
- PXA-1000 analyzer hoses and probe assembly
- DLC cable (for vehicle serial data)
- Integrated power and I/P cable
- Program card
- Cigarette-lighter Y-adapter cable
- VP-411 printer (optional)

CAUTION!

For safety reasons, two technicians are required when test driving with the Gas Analyzer: one to drive the car while the other operates the Tester and Gas Analyzer.

To set up the PXA-1000 and Tester to ensure a valid emissions road test, do the following:

1. Locate a place in the vehicle to operate the PXA-1000 and Tester.

   Locate a convenient place to put your analyzer that will not obstruct the operation of the vehicle. Observe the following:

   - Ensure that the analyzer is level and upright.
   - Keep analyzer away from air flow from heating and A/C vents.
   - Verify that the hoses reach the tailpipe of the vehicle, as well as allow your assistant to control the PXA-1000 with your Tester from the passenger-side seat.
   - Make sure that the drain and exhaust hoses reach the exterior of the vehicle for proper ventilation.
   - Ensure that the power source is located close by.

2. Supply power to the PXA-1000.

   It is important that you choose a power source that is best suited for your testing needs. The power cable supplied with the Gas Analyzer plugs into several possible power sources using the proper adapters. Following is a list of possible sources of power that you may use to supply power to your analyzer and Tester.

2a. Vehicle Cigarette Lighter

   You may use the Y-adapter cable with this power source. This allows you to power the Tester and the PXA-1000 using one power source.

NOTE	12 volts are not available at the cigarette lighter when the vehicle's ignition key is turned off or during cranking. For this reason, you may choose to connect directly to the battery or simply make sure the key is on during Gas Analyzer warm-up through the end of the test. Failure to do so may cause the analyzer to reinitialize and go through its complete warm-up cycle.

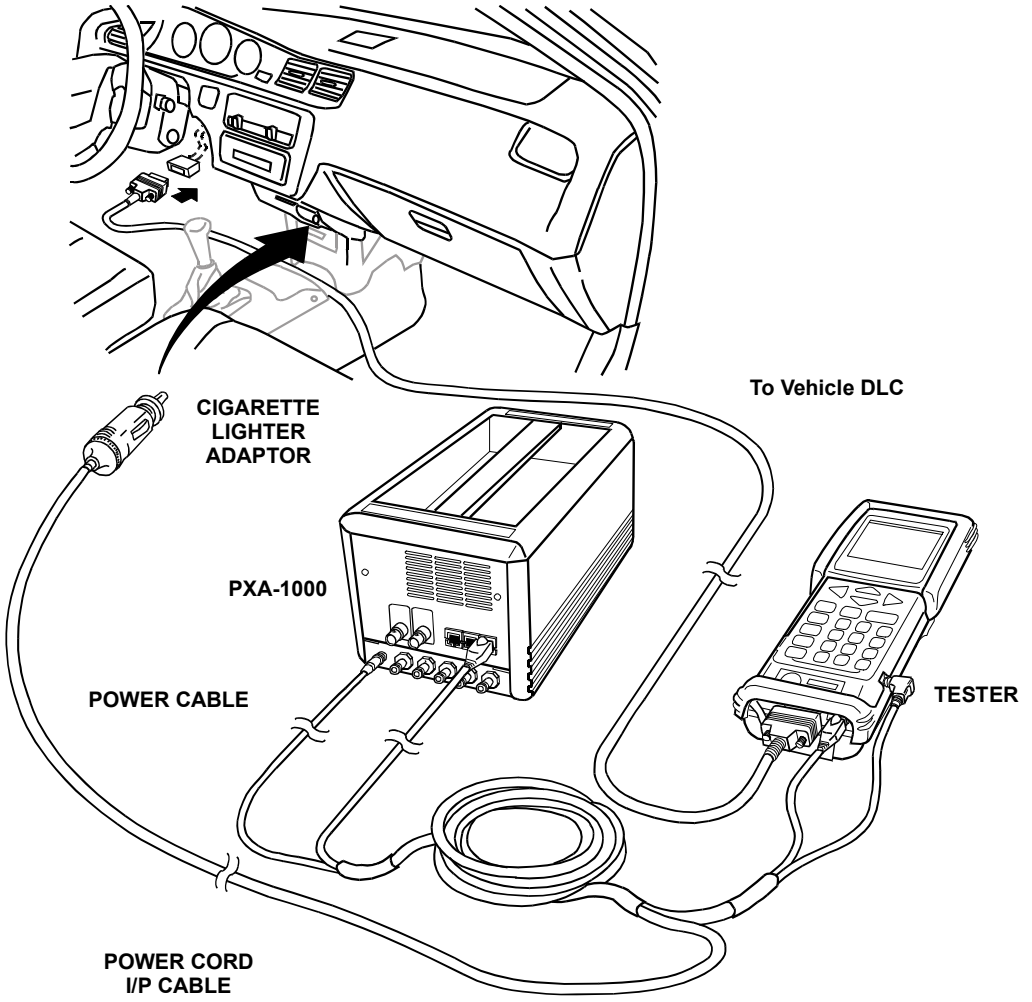


FIGURE 7. Connecting Gas Analyzer and Tester to Cigarette Lighter and Vehicle DLC

2b. Direct Battery Connection

The battery clips allow direct connection to the vehicle's battery for supplying power to the PXA-1000. This type of power source eliminates problems that may occur when using the cigarette lighter, such as momentary loss of power during cranking and causing the analyzer to reinitialize and go through its complete warm-up cycle. Follow the guidelines listed for precautions that need to be taken when routing the power cable outside of the engine compartment.

- Route power cables away from exhaust manifolds, exhaust pipes, and moving parts.
- Avoid pinching power cable between sharp, small-clearance openings such as the vehicle's hood.

- Route the power cable through hood openings that use a weatherstrip for sealing when closed. An example would be vehicles that contain a weatherstrip seal between the fire-wall and the hood.
- Avoid routing the power cable so that it interferes with the operation of the vehicle.

NOTE	Always observe proper polarity (+/-) when connecting directly to the battery.

3. Connect the sampling hoses to the PXA-1000.

   After routing the sampling hoses, connect the hoses to the analyzer. Each port on the analyzer is labeled to match the labels on the sample hose assembly.

   The PXA-1000 sampling hose assembly is equipped with white “quick-disconnect” connectors to allow you to easily connect and disconnect the hoses from the PXA-1000. To connect each hose, press down on the metal tab and slide the connector over the appropriate port of the PXA-1000.

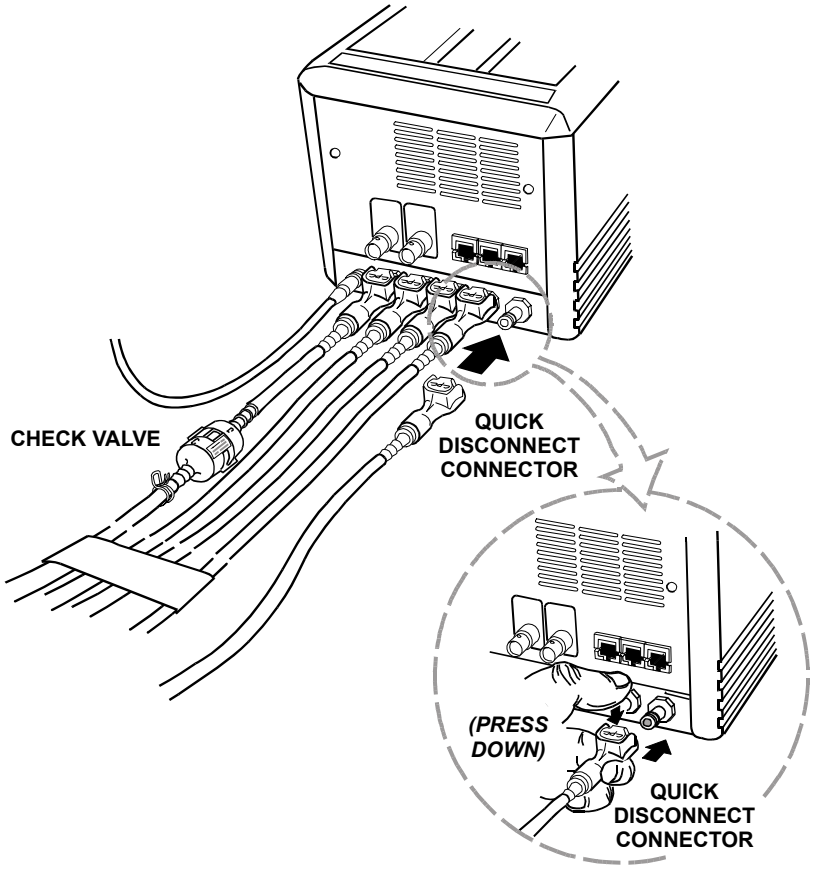


FIGURE 8. Quick-Disconnect Connector

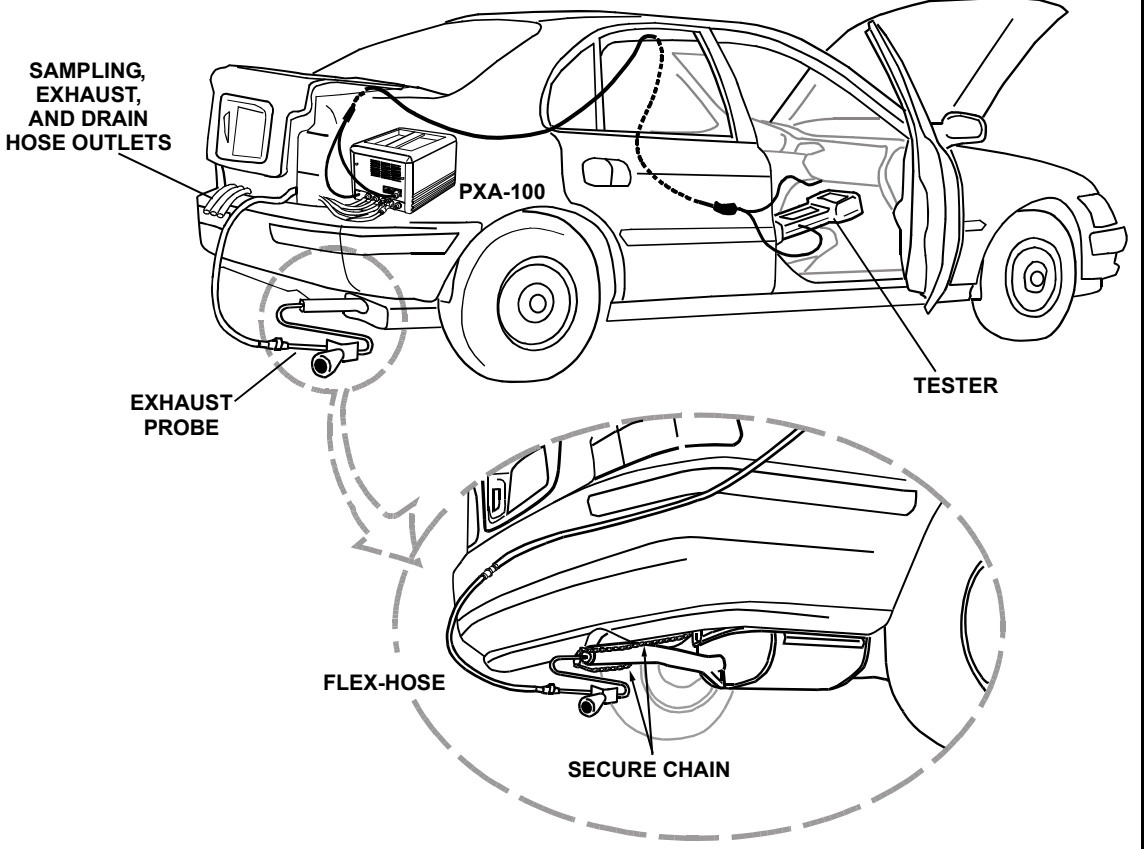


FIGURE 9. Inserting the Sampling Hose into the Tailpipe for Road Testing

4. Insert the probe at least 12" into the tailpipe of the vehicle.

   Insert the end of the sampling probe a minimum of 12" into the tailpipe of the vehicle. The sampling probe comes with two types of retainers to ensure that the probe stays inside the pipe during use. Once the probe is inserted, use the chain to secure tailpipe probe during the road test.

5. Route and secure the sampling, exhaust, and drain hoses out of the vehicle.

   Take up the slack of the remaining hose outside of the vehicle by rolling up the excess and placing it inside. Secure the hoses in place without pinching them. Make certain that the exhaust and drain hoses are routed outside of the vehicle to avoid the risk of exhaust fumes blowing back inside.

WARNING!

Carbon monoxide gas is poisonous. Vent Gas Analyzer exhaust hose and vehicle tailpipe to the outside.

WARNING!

Once the analyzer samples the gas, it deposits the sample through the exhaust and drain hoses of the analyzer sampling hose assembly. It is important that this exhaust is treated the same as the exhaust coming out of the vehicle's tailpipe. Therefore, proper routing of the hoses is required for ventilation of the exhaust and drain.

6. Install the program card.

   The software that operates the Gas Analyzer, as well as all of the Tester features, is contained in the program card. With the Tester powered off, insert the program card into the program card slot of your tester.

7. Connect the PXA-1000 to the Tester using the I/P Cable.

   The Tester controls the PXA-1000 by communicating through the I/P cable. Connect one end of the I/P cable to the Tester's I/P port and the other end to the analyzer's I/P port.

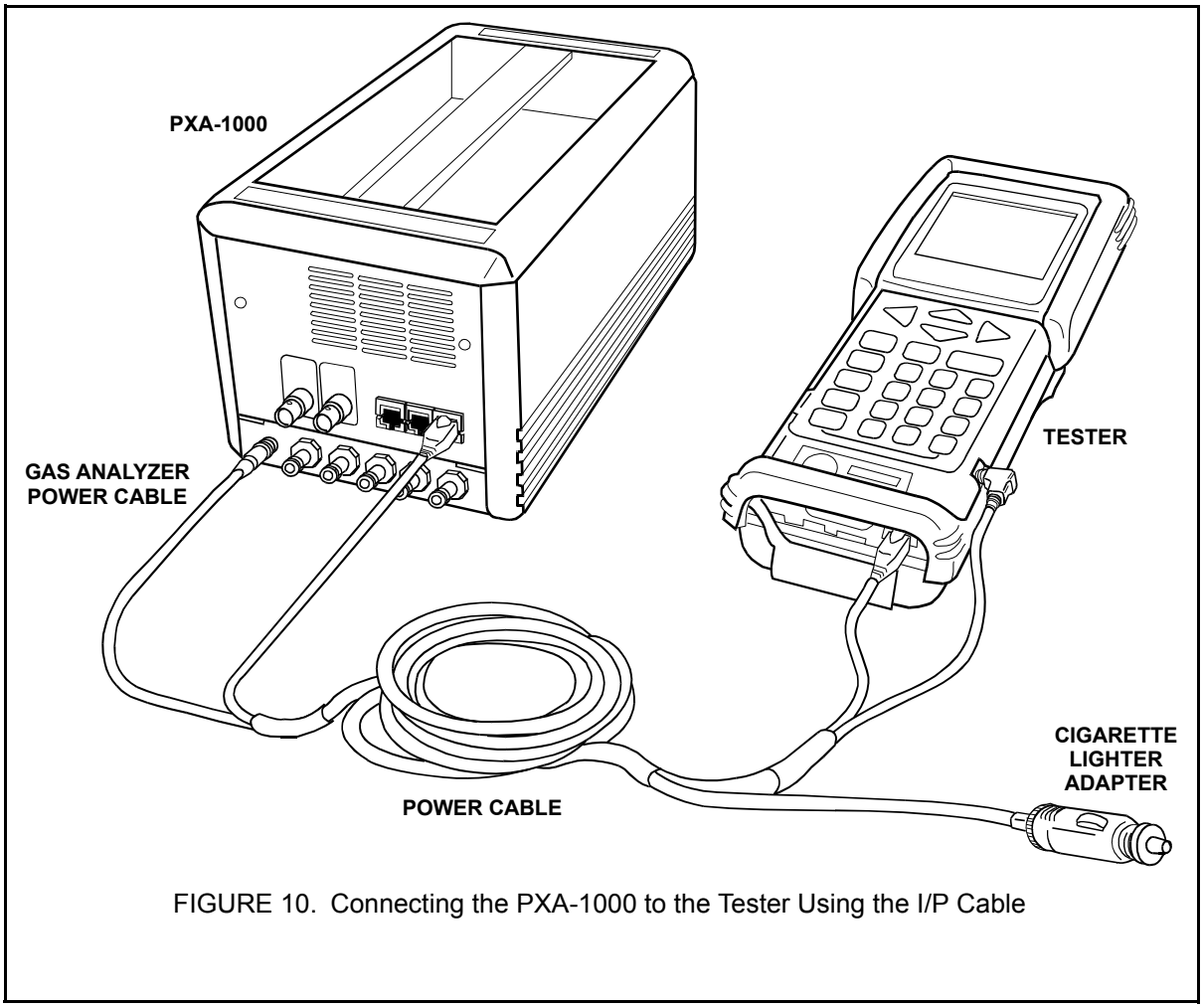


FIGURE 10. Connecting the PXA-1000 to the Tester Using the I/P Cable

8. Connect the DLC cable.

   Refer to the Tester chapter for instructions on connecting the Tester DLC cable to a vehicle.

9. Turn on the Tester.

   The Tester is now ready to control the Gas Analyzer. By pressing the (ON) key, the Tester displays the power-up screen. See Section 5.0: Gas Analysis Mode for Gas Analyzer operation.

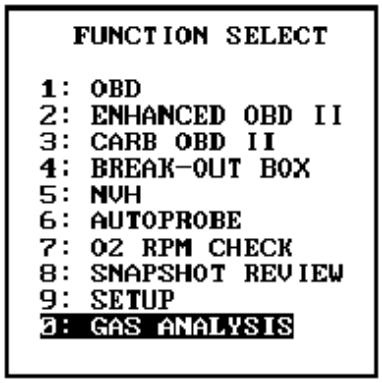
4.0 VEHICLE AND FUNCTION SELECTION

POWER-UP

The program card identification screen is displayed when the Tester is powered up. Press (ENTER) to continue.

ACTIVE KEY

(ENTER) Proceed to the <FUNCTION SELECT> menu.



SELECTING A FUNCTION

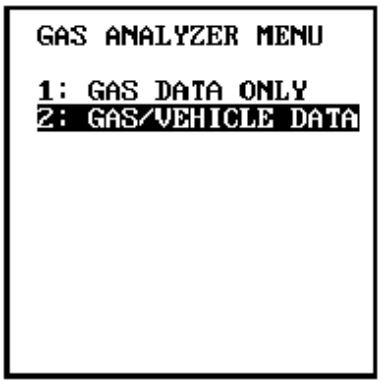
All functions present in the program card are displayed. Refer to the following sections for operating instructions:

<1: OBD>	OBD Operator's Manual
<2: ENHANCED OBD II>	OBD Operator's Manual, Enhanced OBD II section
<3. CARB OBD II>	OBD Operator's Manual, Carb OBD II section
<4: BREAK-OUT BOX>	Break-out Box Operator's Manual
<5: NVHk>	NVH Operator's Manual
<6: AUTOPROBE>	OBD Operator's Manual, Autoprobe section
<7: O2 RPM CHECK>	OBD Operator's Manual, O2S/RPM Check section
<8: SNAPSHOT REVIEW>	OBD Operator's Manual, Snapshot Review section
<9: SETUP>	Tester Operator's Manual, Using the Setup Mode section.
<0: GAS ANALYSIS>	See *Section 5.0 Gas Analysis Mode on page 331.*

<9: SETUP>Tester Operator's Manual, Using the Setup Mode section

ACTIVE KEYS

△ ▽ Change highlighted menu item.
(0) - (9) Select menu item.
(ENTER) Select highlighted menu item.
(EXIT) Return to the power-up screen.



GAS DATA SELECTION

When <GAS ANALYSIS> is selected from the <FUNCTION SELECT> menu, the <GAS ANALYZER> menu is displayed. The Tester can display gas parameters only (HC, CO, CO2, O2, NOx, and AFR) or integrated gas and vehicle data parameters.

Active Keys

△ ▽ Move highlighted cursor between options.
(1) Select gas data only (See *Section 5.0 Gas Analysis Mode on page 331.*).
(2) Select integrated gas and vehicle data.
(ENTER) Choose highlighted menu item.

SELECTING THE VEHICLE

This screen is only displayed if <GAS/VEHICLE DATA> is selected and a vehicle has been previously selected.

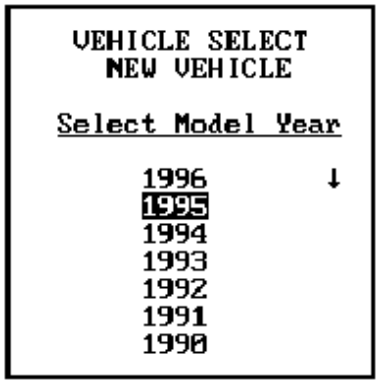
From the <VEHICLE SELECT> menu, you can select a new vehicle to test or select the last vehicle that was tested. Use the ▲ and ▼ keys to select <NEW VEHICLE> or <LAST VEHICLE>, then press (ENTER).

NEW VEHICLE: Select a new vehicle from the vehicle select displays.

LAST VEHICLE: The selection criteria used to select the previous vehicle are displayed. Press (ENTER) to proceed to the <GAS ANALYZER> menu (*Section 5.0 Gas Analysis Mode on page 331*).

ACTIVE KEYS

▲ ▼	Move highlighted cursor between <NEW VEHICLE> or <LAST VEHICLE>.
(ENTER)	Select the highlighted menu item: either new vehicle or last vehicle.
(EXIT)	Return to <GAS ANALYZER> menu.



MODEL YEAR SELECT SCREEN

The available model years are displayed. The "↓" indicates that there are more selections available than can be displayed on the screen. Use the ▲ and ▼ keys to move the cursor between options, then press (ENTER) to select the model year.

ACTIVE KEYS

▲ ▼	Move highlighted cursor between options.
(ENTER)	Select model year.
(EXIT)	Return to <VEHICLE SELECT> screen.

MODEL SELECTION SCREEN

All body types available for the selected model year are displayed. Use the ▲ and ▼ keys to select the type of vehicle you are testing, then press (ENTER) to continue.

ACTIVE KEYS

▲ ▼	Move highlighted cursor between menu options.
(ENTER)	Select vehicle type.
(EXIT)	Return to <MODEL YEAR> screen.

VEHICLE SELECT SCREEN(S)

In some cases, further vehicle identification is required. Up to five select screens may be displayed to select a particular vehicle. Use the ⌃ and ⌄ keys to move the cursor between options, then press (ENTER) to select the option.

ACTIVE KEYS

⌃ ⌄ Move highlighted cursor between options.
(ENTER) Select highlighted menu option.
(EXIT) Return to previous screen.

VEHICLE CONFIRMATION SCREEN

When all of the requested information has been entered, a summary screen of the vehicle configuration is displayed. If the information does not match the vehicle, press (EXIT) to review the previously displayed screens. Correct the information, then proceed through the vehicle selection process again. If the information matches the vehicle you are testing, press (YES) and the <GAS ANALYZER> menu is displayed. The number in the right column is the unique vehicle reference number.

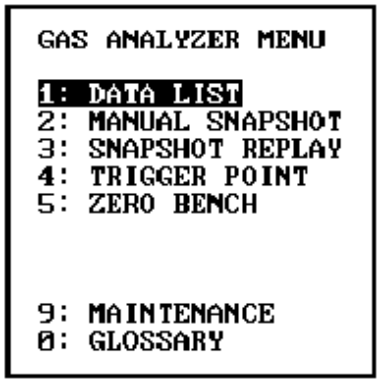
ACTIVE KEYS

(YES) Confirm systems selected.
(EXIT) Return to <VEHICLE SELECT> displays.

5.0 GAS ANALYSIS MODE

Gas Analysis mode includes options for display and snapshot of Gas Analyzer and, if selected, combined Gas Analyzer and vehicle data. In this section, use of the Data List, Snapshot, and Gas Analyzer Zero Bench functions is described. Gas Analyzer Maintenance and Glossary are described later in this manual.

IMPORTANT: The Gas Analyzer should be zeroed before each test. See *Section Zero Gas Analyzer on page 342.*



GAS ANALYZER MENU

All Gas Analyzer functions are accessed through the <GAS ANALYZER> menu.

<1: DATA LIST>	Display Gas Analyzer and, if selected, vehicle data.
<2: MANUAL SNAPSHOT>	Snapshot Gas Analyzer and, if selected, vehicle data.
<3: SNAPSHOT REPLAY>	Replay previously saved snapshot.
<4: TRIGGER POINT>	Select Snapshot Trigger Point.
<5: ZERO BENCH>	Purge and zero Gas Analyzer sensors.
<9: MAINTENANCE>	Perform maintenance.
<0: GLOSSARY>	Display glossary of Gas Analyzer terms and abbreviations.

When <1: DATA LIST> or <2: MANUAL SNAPSHOT> is selected and integrated gas and vehicle data are selected, several preliminary selections are necessary. <SELECT DATA> allows you to choose the parameters to display. <DATA PHASING> compensates for Gas Analyzer response time by delaying the vehicle data parameters to coincide with the gas parameters.

Select Data

Choose the type of data list. <ALL DATA> displays every gas and vehicle parameter available. <USER DATA> (OBD II vehicles only) allows you to choose which vehicle data parameters to display. <ROAD TEST DATA> displays a pre-defined subset of vehicle parameters along with the gas data.

Data Phasing

The Tester has the ability to delay vehicle data until the matching gas data is available. This is called data phasing. When the vehicle data is phased with gas data, changes in the vehicle (i.e., increased RPM) are aligned with the corresponding changes in the gas parameters.

Choose <PHASED> to compute the phase value (time lag) between the vehicle data and gas data and to delay the vehicle data. Choose <NON-PHASED> to immediately display vehicle and gas data. Choose <USE PREVIOUS> to phase vehicle data using a previously calculated phase value. <USE PREVIOUS> only appears as a menu choice if a phase value has been previously calculated for the currently selected vehicle.

Gas Analyzer Warm-Up

If the Gas Analyzer has not completed its warm-up cycle, this screen is displayed when accessing any of the Gas Analyzer functions (Data List, Manual Snapshot, and Zero Bench). The warm-up cycle requires from 5 to 15 minutes. The timer shows the time taken by the warm-up cycle.

A ***CHECK FILTERS*** reminder is displayed during warm-up; this is an ideal time to perform the recommended daily filter inspection. Refer to <MAINTENENCE> (*Section 6.0 Gas Analyzer Maintenance on page 343*) for filter check procedure.

After the warm-up is complete, the Gas Analyzer enters a purge cycle. During a purge, ambient air is drawn into the analyzer to flush the unit of any latent sampled gases.

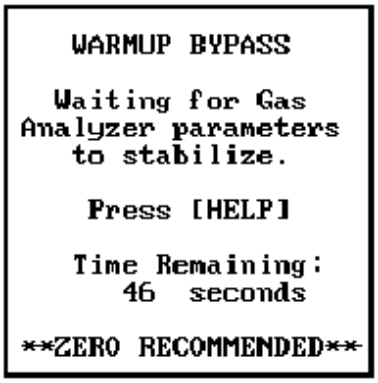
After the purge completes, the gas parameters are zeroed. The Tester emits a beep when the Gas Analyzer completes its warm-up cycle.

Warm-Up Bypass

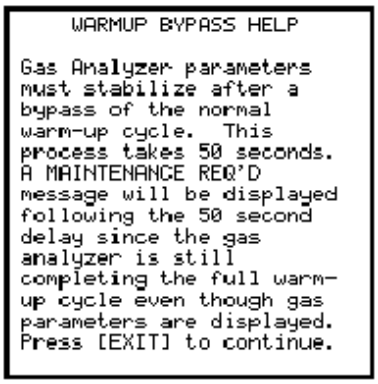
Any time power is interrupted to the Gas Analyzer (e.g., during engine crank), the analyzer needs to recalibrate its internal HC, CO, and CO2 sensors. If power is lost for a short period of time (such as 30 seconds or less), the sensors are able to stabilize to within an acceptable accuracy quickly (about 50 seconds). In this case, the full warm-up can be bypassed, and a warm-up period of only 50 seconds is necessary.

If power is lost to the Gas Analyzer, this screen is displayed.

If communication with the Gas Analyzer is reestablished within 30 seconds of initially losing power, the <WARMUP BYPASS> screen is displayed instead of the normal <WARMUP> screen.



Press (✱) (F9) to bypass the normal warm-up procedure. Only 50 seconds are required to recalibrate the internal sensors to within an acceptable accuracy. This screen is displayed on the tester during the 50-second warm-up bypass procedure.


WARMUP BYPASS HELP
Gas Analyzer parameters must stabilize after a bypass of the normal warm-up cycle. This process takes 50 seconds. A MAINTENANCE REQ'D message will be displayed following the 50 second delay since the gas analyzer is still completing the full warm-up cycle even though gas parameters are displayed. Press [EXIT] to continue.

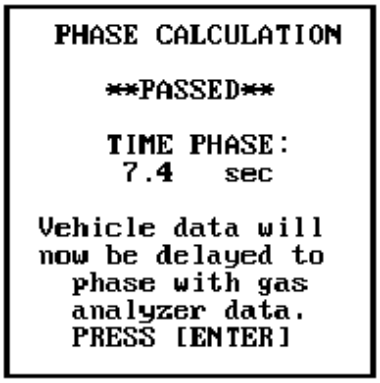
Press (HELP) at this point to display the screen at the left.

It is important to note that a <MAINTENANCE REQ'D> status message is displayed on the Data List following the 50-second warm-up bypass. This is due to the internal sensors finishing their recalibration even though Data List parameters are displayed. The values for HC, CO, and CO2 are not completely accurate at this point but are within an acceptable range. After the Gas Analyzer has completed the recalibration, the <MAINTENANCE REQ'D> status message disappears.

Phase Calculation

When <PHASED> is selected from the <DATA PHASING> menu, the Tester displays the phase calculation procedures.

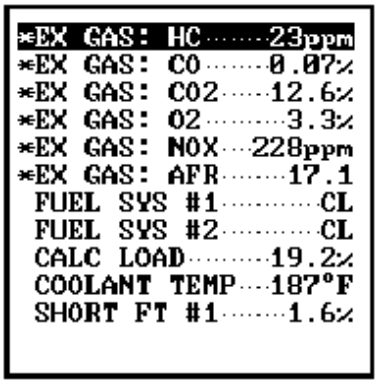
The Tester detects a sharp rise in the engine RPM (from snapping the throttle) and waits for a corresponding rise in the value of CO and fall in the value of CO2. The time lag between these two events (data spikes) is the phase time value.



The Tester displays the phase value (time lag).

The Tester delays display of the data for the duration of the phase value.

DATA LIST MODE



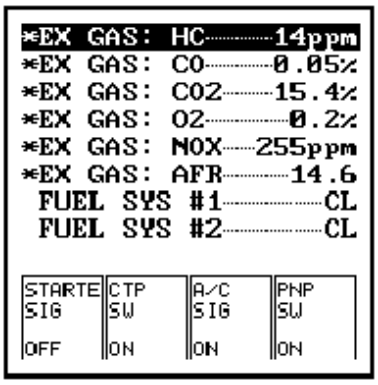
Press (F1) to select the <DATA LIST> mode from any Data List display. The Data List displays all data parameters supplied by the Gas Analyzer and the ECU.

The "*" indicates that this data is from the Gas Analyzer and not the vehicle ECU.

Eleven parameters using large characters or 15 parameters using compressed characters can be displayed at one time. All parameters can be viewed by pressing the △ or ▽ keys.

ACTIVE KEYS

△ ▽	Move the display one parameter.
(✱) △	Move the display one page.
(✱) ▽	
(F2)	Go to <LED/LIST> mode.
(F3)	Go to <BAR GRAPH> mode.
(F4)	Go to <LINE GRAPH> mode.
(F6)	Setup <STRIP CHART> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(#) (F8)	Start Strip Chart.
(#) (F9)	Stop Strip Chart.
(✱) (HELP)	Display parameter information.
(SEND)	Print data list.



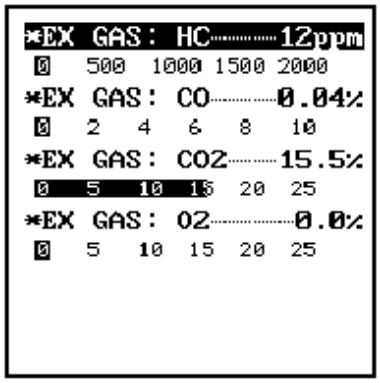
LED/List Mode

Press (F2) to select the <LED/LIST> mode from any Data List display. The <LED/LIST> gives you a quick view of the status of four discrete parameters displayed in boxes at the bottom of the Data List display. The <LED/LIST> also allows you to change the order of the displayed parameters by using the (YES) and (NO) keys.

The status of the discrete parameters is displayed at the bottom of the box and is also indicated by the red and green lights beneath each box. The parameters listed can be selected with the active keys.

ACTIVE KEYS

△ ▽	Move the cursor (highlight) up and down.
(YES)	Change the highlighted parameter to the next parameter in the list.
(NO)	Change the highlighted parameter to the previous parameter in the list.
(✱) (YES)	Change to the next parameter not currently displayed.
(✱) (NO)	Change to the previous parameter not currently displayed.
(F1)	Go to <DATA LIST> mode.
(F3)	Go to <BAR GRAPH> mode.
(F4)	Go to <LINE GRAPH> mode.
(F6)	Setup <STRIP CHART> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(#) (F8)	Start Strip Chart.
(#) (F9)	Stop Strip Chart.
(✱) (HELP)	Display parameter information.

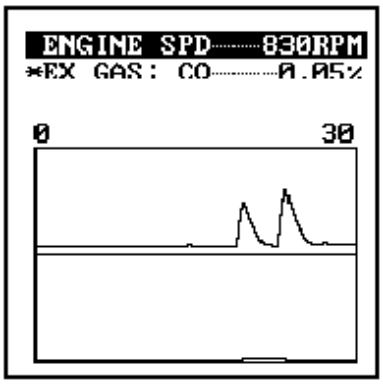


Bar Graph Mode

Press (F3) to select the <BAR GRAPH> mode from any Data List display. <BAR GRAPH> shows relationships among up to five different data parameters (or six parameters using compressed characters). The displayed data parameters can be selected with the active keys.

ACTIVE KEYS

△ ▽	Move the cursor (highlight) up and down.
(YES)	Change the highlighted parameter to the next parameter in the list.
(NO)	Change the highlighted parameter to the previous parameter in the list.
(✱)(YES)	Change to the next parameter not currently displayed.
(✱)(NO)	Change to the previous parameter not currently displayed.
(F1)	Go to <DATA LIST> mode.
(F2)	Go to <LED/LIST> mode.
(F4)	Go to <LINE GRAPH> mode.
(F6)	Setup <STRIP CHART> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(#)(F8)	Start Strip Chart.
(#)(F9)	Stop Strip Chart.
(✱)(HELP)	Display parameter information.
(SEND)	Print data list.

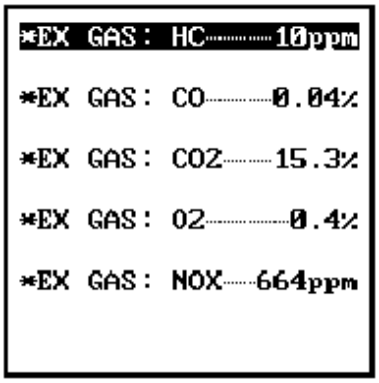


Line Graph Mode

Press (F4) to select the <LINE GRAPH> mode from any Data List display. <LINE GRAPH> displays two data parameters on the moving line graph. The displayed data parameters can be selected with the active keys.

ACTIVE KEYS

◁ ▷	Change <LINE GRAPH> time scale. Allowable scales are 60, 100, 240, 300, and 600 seconds.
△ ▽	Move the cursor (highlight) up and down.
(YES)	Change the highlighted parameter to the next parameter in the list.
(NO)	Change the highlighted parameter to the previous parameter in the list.
(F1)	Go to <DATA LIST> mode.
(F2)	Go to <LED/LIST> mode.
(F3)	Go to <BAR GRAPH> mode.
(F6)	Setup <STRIP CHART> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(#)(F8)	Start Strip Chart.
(#)(F9)	Stop Strip Chart.
(✱)(HELP)	Display parameter information.
(SEND)	Print data list.



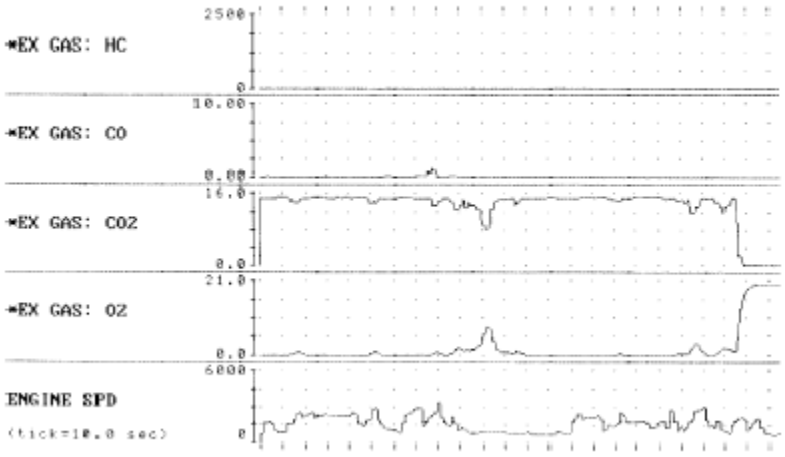
Strip Chart Mode

Press (F6) to select the <STRIP CHART> setup from any Data List display. The <STRIP CHART> setup allows you to select up to five parameters to be printed. The <STRIP CHART> mode only works with the optional VP-411 printer. Press (#)(F8) to start <STRIP CHART> printing. Live data will be printed until it is turned off with (#)(F9) or the Data List is exited.

ACTIVE KEYS

△ ▽	Move the cursor (highlight) up and down.
(YES)	Change the highlighted parameter to the next parameter in the list.
(NO)	Change the highlighted parameter to the previous parameter in the list.
(✱)(YES)	Change to the next parameter not currently displayed.
(✱)(NO)	Change to the previous parameter not currently displayed.
(F1)	Go to <DATA LIST> mode.
(F2)	Go to <LED/LIST> mode.
(F3)	Go to <BAR GRAPH> mode.
(F4)	Go to <LINE GRAPH> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(#)(F8)	Start Strip Chart.
(#)(F9)	Stop Strip Chart.
(✱)(HELP)	Display parameter information.
(SEND)	Print data list.

SAMPLE OF STRIP CHART PRINTOUT



GAS ANALYZER CONTROL HOT KEYS

At any time during the display of gas data, you can switch the analyzer sample from exhaust gas to ambient air by pressing (✱)(F1).

You can zero the Gas Analyzer at any time during the display of gas data. This is accomplished with the (✱)(F2) keys. This procedure should be carried out before a snapshot operation or whenever the **ZERO RECOMMENDED** status appears at the bottom of the data display. The Gas Analyzer requests that a zero be performed after about every 30 minutes of use or less.

At any time during the display of gas data, you can toggle the pump on and off by pressing (✱)(F3). The pump should be turned off whenever the analyzer is not sampling gas or purging. This prolongs the life of the analyzer and reduces ambient noise.

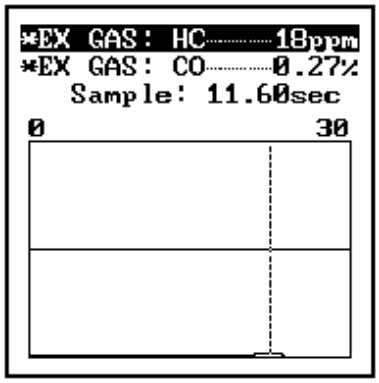
HOT KEY CHART

In any Data List mode ((1), (2), (3), (4), (6)):

(✱)(F1) Toggle sample input between vehicle exhaust and ambient air.
(✱)(F2) Zero the Gas Analyzer (same as (5) from <GAS ANALYZER> menu).
(✱)(F3) Toggle analyzer pumps on and off.

SNAPSHOT MODE

The snapshot function is used to support use of the Gas Analyzer during road-test operation or to capture intermittent problems. Snapshot collects Gas Analyzer and, if selected, vehicle data for later analysis. Snapshot durations of up to ten minutes are supported.



Manual Snapshot

Press (2) to select the <MANUAL SNAPSHOT> mode from the <GAS ANALYZER> menu. Press the (ENTER) key to trigger the snapshot and begin capturing data.

Data Capture Phase

The Line Graph screen appears. Use the ◁ and ▷ keys to select the desired time scale for the snapshot before trigger. Use the △ and ▽ keys to select a data parameter. <WAIT: MANUAL TRIGGER> is displayed at the bottom of the screen until the snapshot is triggered. When a trigger occurs, <TRIGGER> is displayed at the bottom of the screen while data is being saved.

ACTIVE KEYS

◁ ▷	Select snapshot capture time scale. Allowable time scales are 60, 100, 240, 300, and 600 seconds (<LINE GRAPH> mode only).
△ ▽	Move the display up or down one parameter.
(✱)△	Move the display one page (<DATA LIST> mode only).
(✱)▽	
(YES)	Change the highlighted parameter to the next parameter in the list. (<LED/LIST>, <BAR GRAPH>, and <LINE GRAPH> modes only.)
(NO)	Change the highlighted parameter to the previous parameter in the list. (<LED/LIST>, <BAR GRAPH>, and <LINE GRAPH> modes only.)
(ENTER)	Triggers the snapshot and terminate data capture.
(F1)	Go to <DATA LIST> mode.
(F2)	Go to <LED/LIST> mode.
(F3)	Go to <BAR GRAPH> mode.
(F4)	Go to <LINE GRAPH> mode.
(F9)	Change between large and compressed character size.
(F0)	Turn cursor on and off.
(✱)(HELP)	Display parameter information.
(SEND)	Print data list.

NOTE	Do not operate the keyboard while the Tester is saving vehicle data.

Snapshot Save

After completion of Data Capture, the snapshot can be saved for later review.

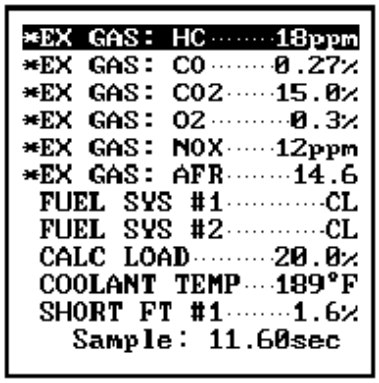
Press (YES) to save this data set or (NO) to continue without saving the data. The current snapshot can be reviewed immediately even if not saved.

The snapshot data is saved on the Program Card. Make sure that the same Program Card is used when reviewing saved snapshot data.

ACTIVE KEYS

(YES) Save snapshot data.
(NO) Continue to Data Display phase without saving snapshot data.

The screen at the left appears if an attempt is made to store a snapshot when the memory is full.



Data Display Phase

At completion of data capture phase, <Sample> and a time stamp are displayed at the bottom of the screen. Data captured in the <SNAPSHOT> mode can be displayed in all of the formats available in the <DATA LIST> mode except for <STRIP CHART> mode.

ACTIVE KEYS

◁ ▷ Sequence through the sample displayed.
△ ▽ Move the display up or down one parameter.
(✱)△ (✱)▽ Move the display one page. (<DATA LIST> mode only).
(YES) Change the highlighted parameter to the next parameter in the list. (<LED/LIST>, <BAR GRAPH>, and <LINE GRAPH> modes only).
(NO) Change the highlighted parameter to the previous parameter in the list. (<LED/LIST>, <BAR GRAPH>, and <LINE GRAPH> modes only).
(F1) Go to <DATA LIST> mode.
(F2) Go to <LED/LIST> mode.
(F3) Go to <BAR GRAPH> mode.
(F4) Go to <LINE GRAPH> mode.
(F9) Change between large and compressed character size.
(F0) Turn cursor on and off.
(✱)(HELP) Display parameter information.
(SEND) Print data list.

Replay Snapshot

Press (3) to select <SNAPSHOT REPLAY> mode from the <GAS ANALYZER> menu. Snapshot Event Replay options are listed below:

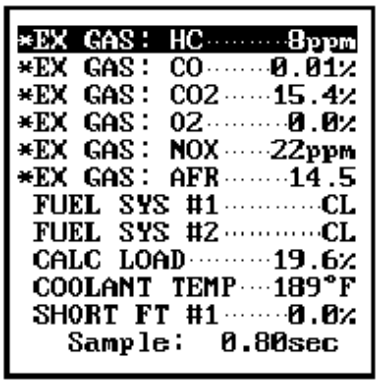
ACTIVE KEYS

△ ▽ Move the cursor (highlight) up and down.
(ENTER) Display vehicle information of the selected snapshot data.
(✱)(ENTER) Delete the selected snapshot from the list.

The vehicle information of the selected snapshot data is displayed.

ACTIVE KEY

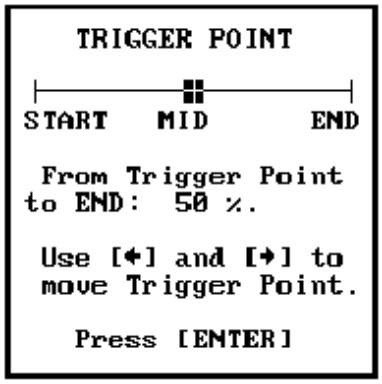
(ENTER) Displays the selected snapshot data.



The data parameters that were captured during the event are displayed. The Data Display phase is indicated by <Sample> and a time stamp.

ACTIVE KEYS

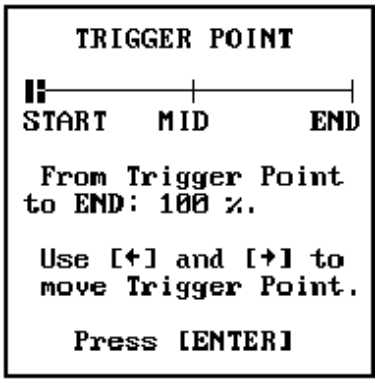
◁ ▷ Sequence through the sample displayed.
△ ▽ Move the display up or down one parameter.
(✱)△ Move the display one page (<DATA LIST> mode only).
(✱)▽
(YES) Change the highlighted parameter to the next parameter in the list (<LED/LIST>, <BAR GRAPH>, and <LINE GRAPH> modes only).
(NO) Change the highlighted parameter to the previous parameter in the list (<LED/LIST>, <BAR GRAPH>, and <LINE GRAPH> modes only).
(F1) Go to <DATA LIST> mode.
(F2) Go to <LED/LIST> mode.
(F3) Go to <BAR GRAPH> mode.
(F4) Go to <LINE GRAPH> mode.
(F9) Change between large and compressed character size.
(F0) Turn cursor on and off.
(✱)(HELP) Display parameter information.
(SEND) Print data list.



Trigger Point

Press (4) to select <TRIGGER POINT> from the <SNAPSHOT> menu. <TRIGGER POINT> allows you to choose how much data to save before or after the trigger.

The display at the left stores 50% of the data before and 50% of the data after the trigger point.

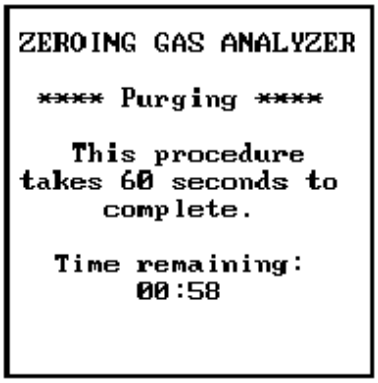


The display at the left stores 100% of the data after the trigger point.

The display at the left stores no data after the trigger point.

ACTIVE KEYS

◁ ▷ Move the trigger point marker left or right.
(ENTER) Confirm trigger point setting and return to the <SNAPSHOT> menu.



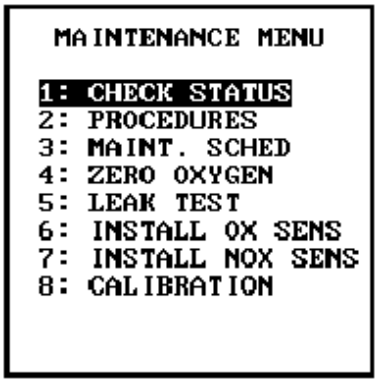
Zero Gas Analyzer

Select (5) from the <GAS ANALYZER> menu to zero the Gas Analyzer. This function zeros the Gas Analyzer so that the gas data readings are accurate. The zeroing function requires 60 seconds to complete.

IMPORTANT: The Gas Analyzer should be zeroed before each use.

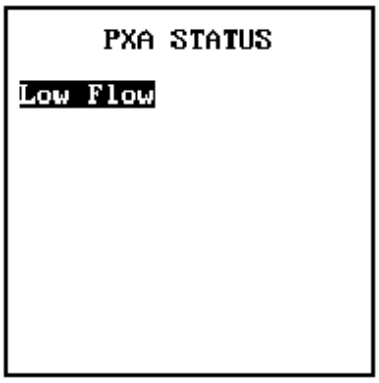
6.0 GAS ANALYZER MAINTENANCE

The <MAINTENANCE> menu is selected by pressing (9) from the <GAS ANALYZER> menu.



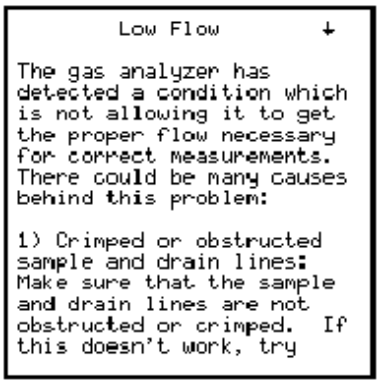
Instructions and procedures are located under the <MAINTENANCE> menu to assure proper Gas Analyzer operation.

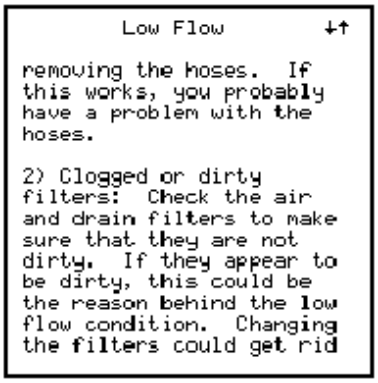
<1: CHECK STATUS>	Gas Analyzer status.
<2: PROCEDURES>	Instructions for changing filters.
<3: MAINT. SCHED.>	Gas Analyzer maintenance schedule.
<4: ZERO OXYGEN>	Instructions for oxygen sensor zeroing.
<5: LEAK TEST>	Checks Gas Analyzer for leaks in the sample system.
<6: INSTALL O2 SENS>	Instructions for oxygen sensor installation.
<7: INSTALL NOx SENS>	Instructions for NOx sensor installation.
<8: CALIBRATION>	Performs calibration procedure.

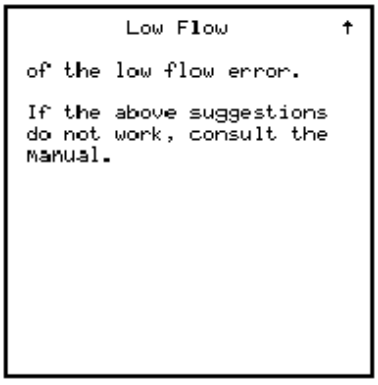


CHECK STATUS

<CHECK STATUS> provides information concerning the condition of the Gas Analyzer. If there are no pending warnings or errors, then the message “Gas Analyzer Status OK” is displayed. If any messages are displayed, use the ⌃ and ⌄ keys to select the message, then press (ENTER). A description of the message is then displayed. Press (EXIT) to return to the status screen. During the warm-up period, <CHECK STATUS> may display “Warm-up in Progress” and “Bench Warning.” A “Zero Required” message tells you to zero the Gas Analyzer. After warm-up, if “Bench Warning” or any other warning messages are displayed, refer to Appendix A Trouble Shooting: If You're Having A Problem on page 358.


Low Flow ↓
The gas analyzer has detected a condition which is not allowing it to get the proper flow necessary for correct measurements. There could be many causes behind this problem:
1) Crimped or obstructed sample and drain lines: Make sure that the sample and drain lines are not obstructed or crimped. If this doesn't work, try


Low Flow ↓↑
removing the hoses. If this works, you probably have a problem with the hoses.
2) Clogged or dirty filters: Check the air and drain filters to make sure that they are not dirty. If they appear to be dirty, this could be the reason behind the low flow condition. Changing the filters could get rid



PROCEDURES

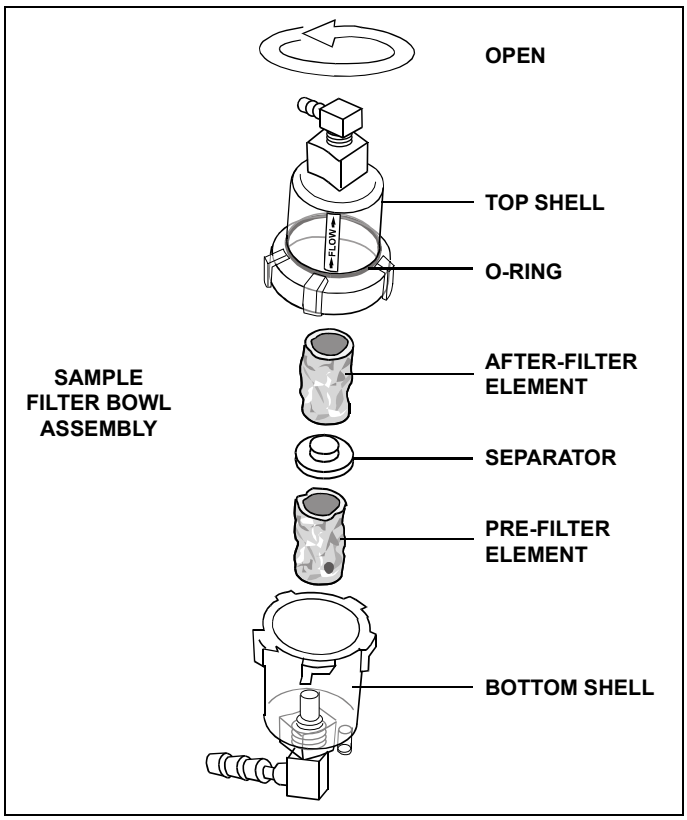
The PXA Gas Analyzer has four user-replaceable filters. This section describes the filters and the benefits of checking them on a regular schedule.

- Sample Filter Bowl
- Drain Filter
- Check Valve
- Air Filter

Sample Filter Bowl Elements

The filter bowl assembly contains two filter elements. Each filter should be checked visually on a daily basis. Generally, after 25 cumulative hours of exhaust gas sampling, both filters should be replaced. For instance, if the average test lasts 15 minutes, change the filters after every 100 tests.

NOTE Change the filter elements at the first sign of discoloration.



Vehicle exhaust enters the lower filter from the inside. It may not show from the outside how dirty it really may be inside. If either filter becomes restricted, the gas values may change slowly or a low-flow condition may occur. It is normal for a minimal amount of water to be sitting in the filter bowl.

Operating the Gas Analyzer with extremely dirty filters may cause particles to clog the inside of the measurement cell.

CAUTION!

Failure to comply with the maintenance procedures may void the warranty.

Replacing Filters

Open the hinged panel and slightly tug on the filter bowl assembly. Do not pull past the point of any resistance. Twist the top half of the plastic bowl counterclockwise to the lower half. The bowl may be a tight fit but will loosen after it has been disassembled a few times.

Replace both filters at the same time. The lower filter is denoted by a red dot or stripe. The lower filter is a 14-micron particulate filter. The upper filter is a 10-micron particulate filter. Wash the bowl with mild soap and water if necessary. Check the location of the rubber separator between the two filters for proper seating. Twist the top half clockwise to the lower half to reconnect the housing.

Perform a Leak Test to assure proper sealing. (See *Section Leak Test on page 349.*)

Drain Filter

The drain filter is located to the right of the filter bowl assembly and protects the drain pump from clogging. The drain filter is a disposable plastic filter. If the filter starts to clog, then water can accumulate in the filter bowl. The drain filter is typically replaced every two to three months, depending on usage.

Replacing the Drain Filter

The drain filter is held in place with two hose clamps. Remove both hose clamps from the filter. The larger end points toward the filter bowl. Replace the filter and reattach the hose clamps.

Perform a Leak Test to assure proper sealing. (See *Section Leak Test on page 349.*)

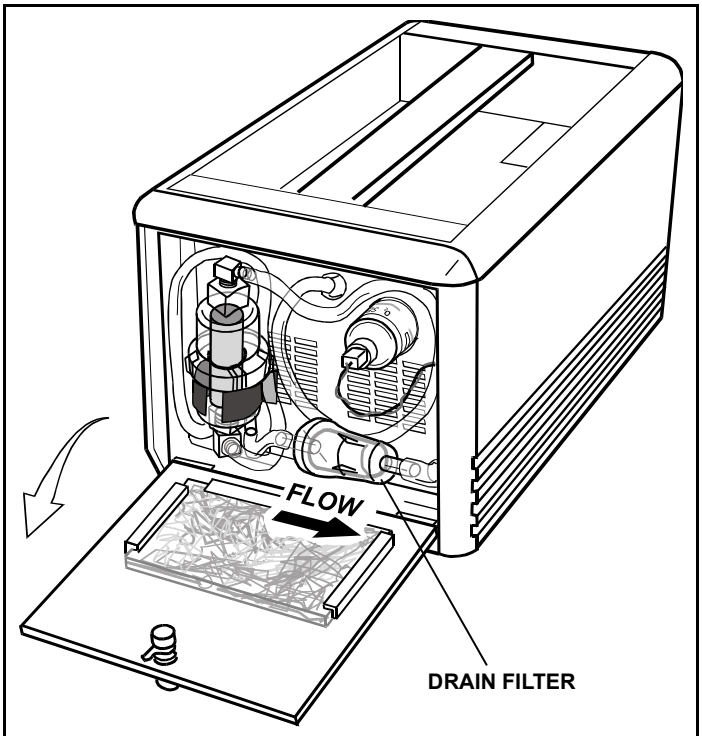


FIGURE 11. Replacing the Drain Filter

Check Valve

The red check valve is located on the drain hose near the connector. The check valve prevents water from backing into the Gas Analyzer. The removable center cartridge must be cleaned every two weeks to assure that the hose does not clog.

To clean the Check Valve, do the following:

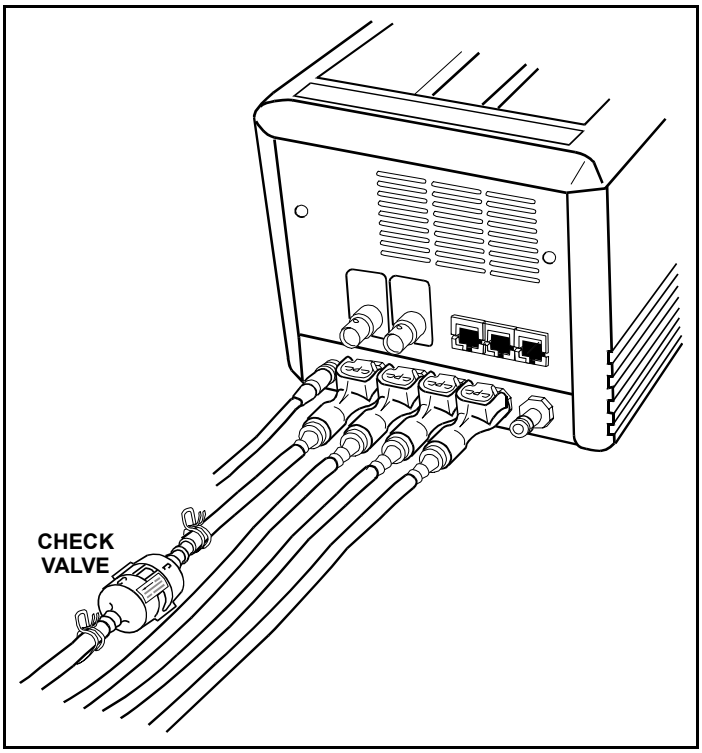
1. Twist the check valve counterclockwise to open.
2. Remove the brown center cartridge. Note that the spring side of the valve is located on the half of the check valve nearest the Gas Analyzer.
3. Soak the cartridge in a small pan with mild detergent and warm water for an hour to remove particles and oils from around the seal.

CAUTION!

CAUTION

Do not use hydrocarbon-based cleaners to clean check valve cartridge.

4. Inspect the O-rings located in both halves of the check valve for cracking.
5. Blow-dry the brown cartridge using shop air.
6. Place the cartridge back in the case halves, the spring side facing the Gas Analyzer.
7. Twist the check valve halves together clockwise until they lock.
8. Perform a Leak Test to assure system integrity. (See *Section Leak Test on page 349.*)

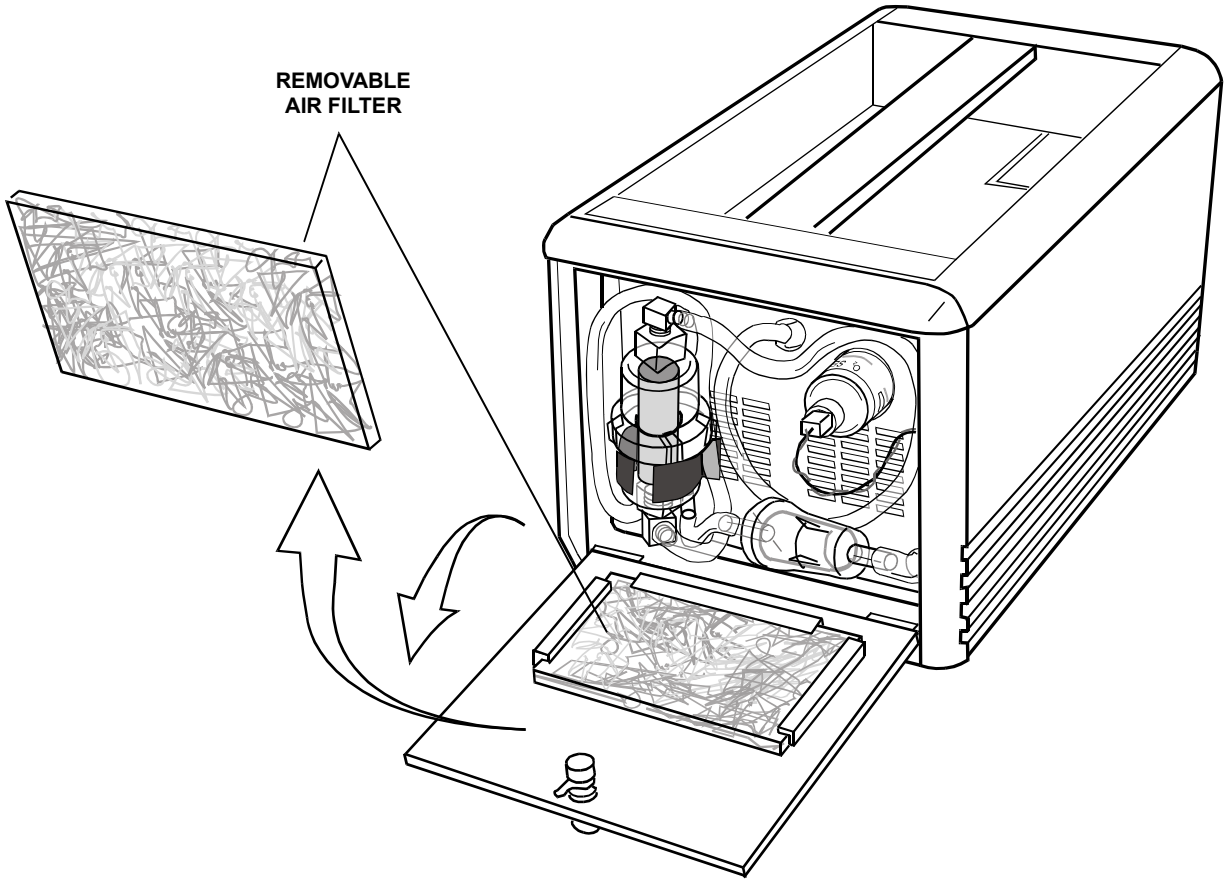


Air Filter

The air filter is a foam element located inside on the hinged panel covering the filter bowl assembly. It keeps the air used to cool the electronics inside the Gas Analyzer free of oils and grease. It should be inspected daily.

To clean the Air Filter, do the following:

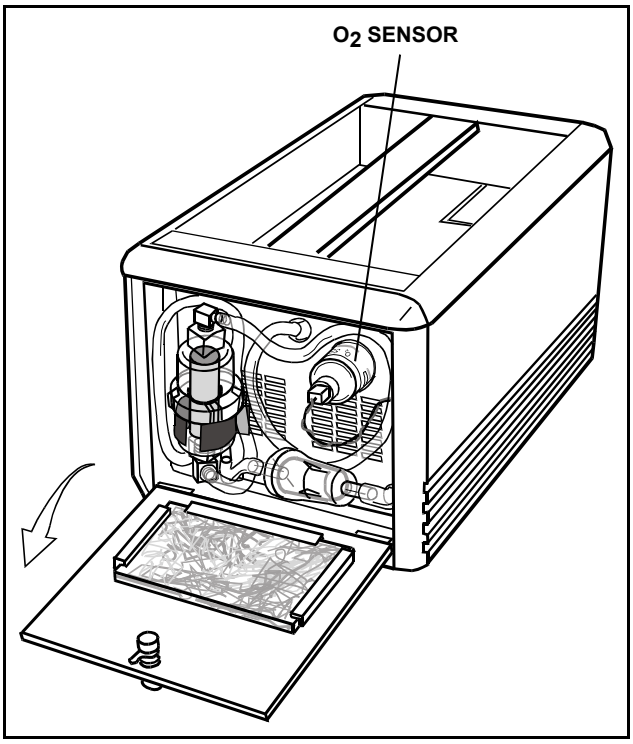
1. Locate the air filter inside the hinged filter door.
2. Slide the filter out of the bracket.
3. Wash the filter with mild detergent and water. Rinse. Wring the filter until it is virtually free of all water.
4. Slide the filter into the bracket.
5. Fasten hinged door prior to applying power to the Gas Analyzer.



MAINTENANCE SCHEDULE

COMPONENT	INTERVAL	OPERATION
Sample Filters	Daily	Inspect and replace if dirty
Drain Filter	Daily	Inspect and replace if dirty
Leak Test	Daily	Test
Check Valve	Every 2 weeks	Clean
Air Filter	Weekly	Clean
Gas Calibration	4 weeks or as required	Calibrate
Sampling Hose	Software indicates Low Flow or HC hang-up problem	Clean
Oxygen Sensor Replace	Approx. 1 year. Software indicates replacement.	Replace
NO_X Sensor	Approx. 2 years. Software indicates replacement.	Replace

ZEROING O2S (OXYGEN) SENSOR



Zeroing the oxygen sensor manually is only required if, while reading calibration gas, the oxygen reading is not within 00.0% ± 0.2%. (See *Section Calibration Verification on page 353.*)

1.Select ④ (Zero Oxygen) from the <MAINTENANCE> menu.

2.Disconnect the cable from the oxygen sensor.

3.If the sensor will not zero, repeat the test.

4.If the sensor continues to fail, the sensor may need replacement or the Gas Analyzer may have a hardware problem.

5.Reconnect the cable to the oxygen sensor.

LEAK TEST

The Leak Test is used to check the Gas Analyzer for leaks. Leaks cause incorrect readings, usually indicating that the vehicle emissions are cleaner than they are. The Leak Test should be run daily to ensure that emissions readings are not diluted. In addition, the Leak Test should be run after changing gas filters and reattaching the sample hose or probe tip.

1. From the <MAINTENANCE> menu, press (5) to select Leak Test.
2. Place the probe tip cap on to the sample probe tip, then press (ENTER).
3. The Gas Analyzer turns the pumps on to draw a vacuum. After the pumps turn off, the unit checks for pressure leaks for 20 seconds. If a leak is detected, “Leak Test Failed” is displayed. Otherwise, the message “Leak Test Passed” is displayed.

Leak Test Failed

1. Disconnect the hose assembly from the Gas Analyzer. Rerun the Leak Test, blocking the sample port instead of the probe tip. If the Leak Test passes, then the hose assembly contains the leak and must be repaired or replaced.
2. If the Gas Analyzer fails the second Leak Test, check the following areas:
   - The seal between the filter bowl halves.
   - The hose connections on the filter bowl and drain filter.
   - The red check valve on the drain hose.
   - All threaded connections.
   - Oxygen and NOx sensors.
3. **Suggestion for finding the leak:** Apply a small amount of isopropyl alcohol to the suspect area while reading the HC under <DISPLAY DATA>. Move slowly from one section to the next, since the analyzer may take five to six seconds to measure any change. An increase in HC indicates a possible leak.

```
INSTALL NEW O2

* Precondition O2
  sensor. SEE MANUAL

* Disconnect power
  from Gas Analyzer

* Install new O2S.
  DO NOT RECONNECT
  O2 SENSOR HARNESS
    Press [ENTER]
```

INSTALLING NEW O2 SENSOR

The software indicates when the O2 (oxygen) sensor requires replacement. The normal life expectancy is one year. The sensor degrades in the presence of oxygen. Because of this, replacement sensors should remain in a sealed package until needed in order to maximize sensor life.

To replace the O2S Sensor, do the following:

1. **Precondition the sensor:** Open oxygen sensor package 5 to 10 hours prior to installation. If the sensor is calibrated immediately after exposure to air, it may drift.
2. While the Gas Analyzer is shut off, replace the old sensor with the new sensor; remember to reconnect the O2S cable to the oxygen sensor.
3. Discard the old oxygen sensor.
4. Perform a Leak Test (5 from the <MAINTENANCE> menu) to check system integrity.
5. Run the <INSTALL O2 SENS> by selecting 6 from the <MAINTENANCE> menu.

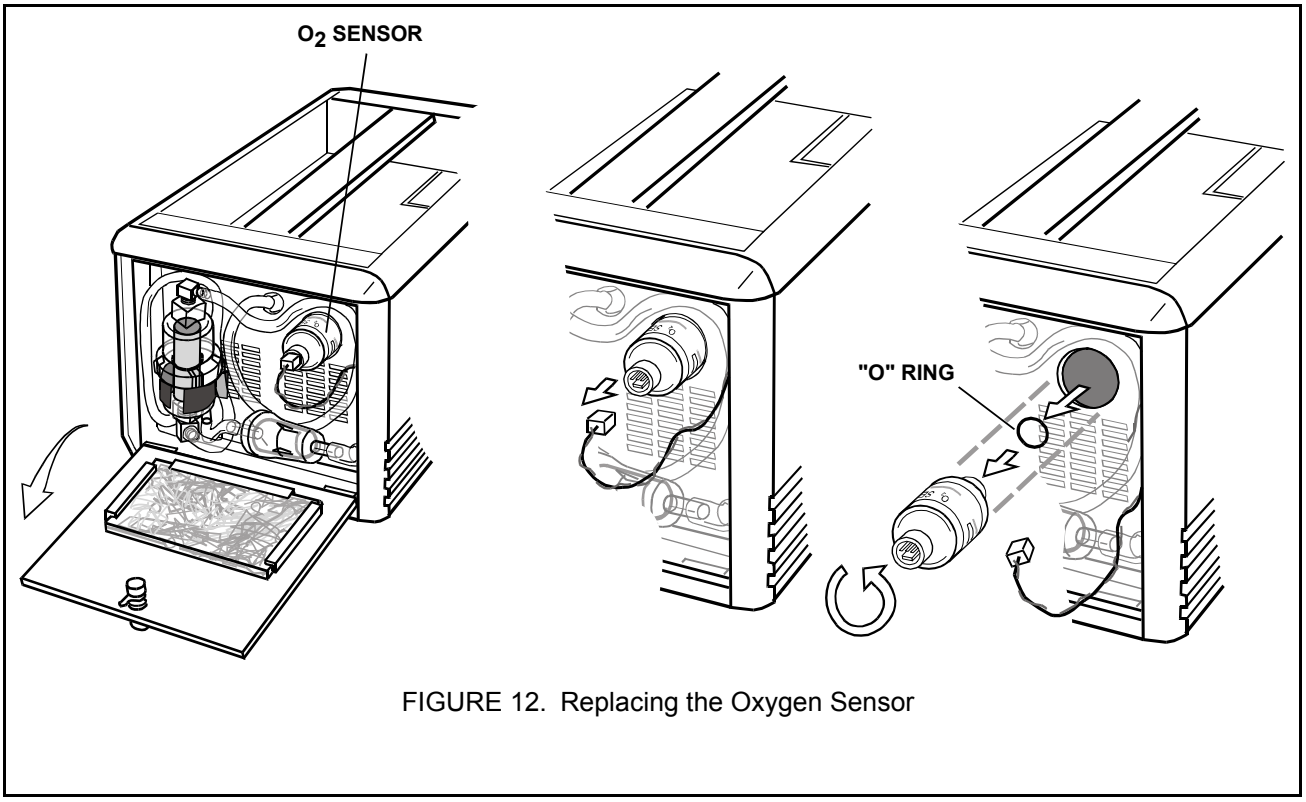


FIGURE 12. Replacing the Oxygen Sensor

```
INSTALL NEW NOx

* Disconnect power
  from Gas Analyzer

* Install new NOx
  sensor

Press [ENTER]
```

INSTALLING NOx SENSOR

The NOx sensor module requires replacement every two to three years based on frequency of usage and amount of NOx in the gas sample. The Gas Analyzer indicates when a new NOx sensor is required.

To replace the NOx Sensor, do the following:

1. Remove power from the Gas Analyzer.
2. Remove the screw on the NOx cover plate using a $\frac{1}{16}$" hex head.
3. With one hand pressing the tab against the side of the Gas Analyzer, use the other hand to lift the old sensor out vertically.
4. Remove new NOx sensor from its case. Remove red cap from edge connector. Discard the old NOx sensor.
5. Slide the new sensor into the base unit. The latch will snap over the sensor after it has seated fully in the base.
6. From the <MAINTENANCE> menu, select <7: INSTALL NOx SENS>.
7. Perform a Leak Test to check system integrity.
8. Reattach the NOx access cover.

NOTE	The new sensor is marked with its activation date on its label. It comes preactivated because of testing prior to shipping.

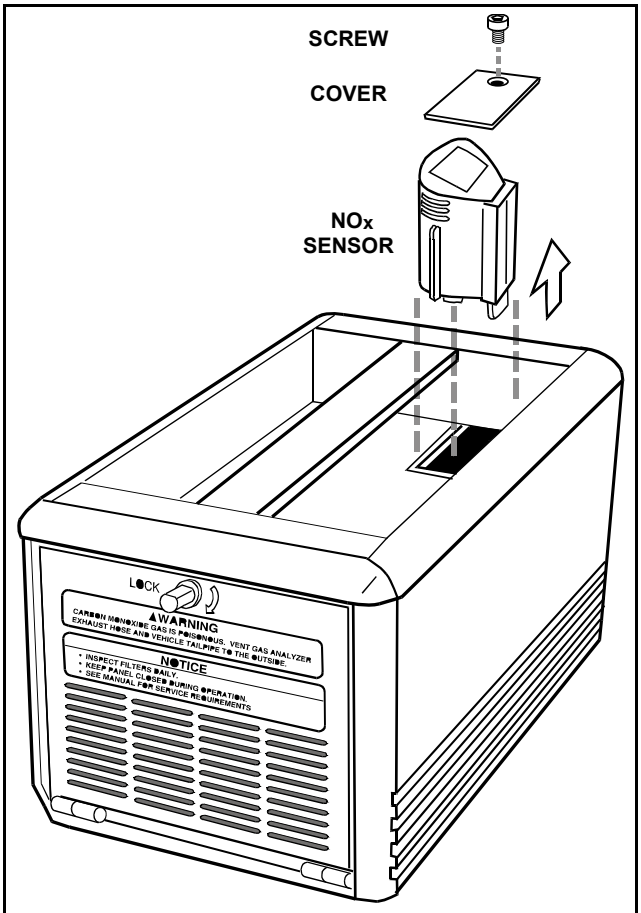


FIGURE 13. Replacing the NOx Sensor

CALIBRATION MENU

1: SINGLE POINT CAL

GAS ANALYZER CALIBRATION

As with any precision instrument, periodic calibration is necessary to maintain peak operating performance. On the PXA series of gas analyzers, there are two types of calibration:

- Zeroing
- Single-point Gas Calibration

Zeroing is a normal operating function and is covered in *Section Zero Gas Analyzer on page 342*.

From the <MAINTENANCE> menu, select <8: CALIBRATION>.

<1: SINGLE POINT CAL> Performs Single-point Calibration using Quad Blend gas.

Calibration Setup

Single-point Gas Calibration with a known-value calibration gas is recommended every four weeks or as necessary to meet your individual state's requirement. For all gas calibration procedures, attach the regulator hose quick-disconnect to the cal gas port on the Gas Analyzer as shown in the illustration below.

WARNING!

Carbon Monoxide gas is poisonous. Vent gas analyzer exhaust hose and vehicle tailpipe to the outside.

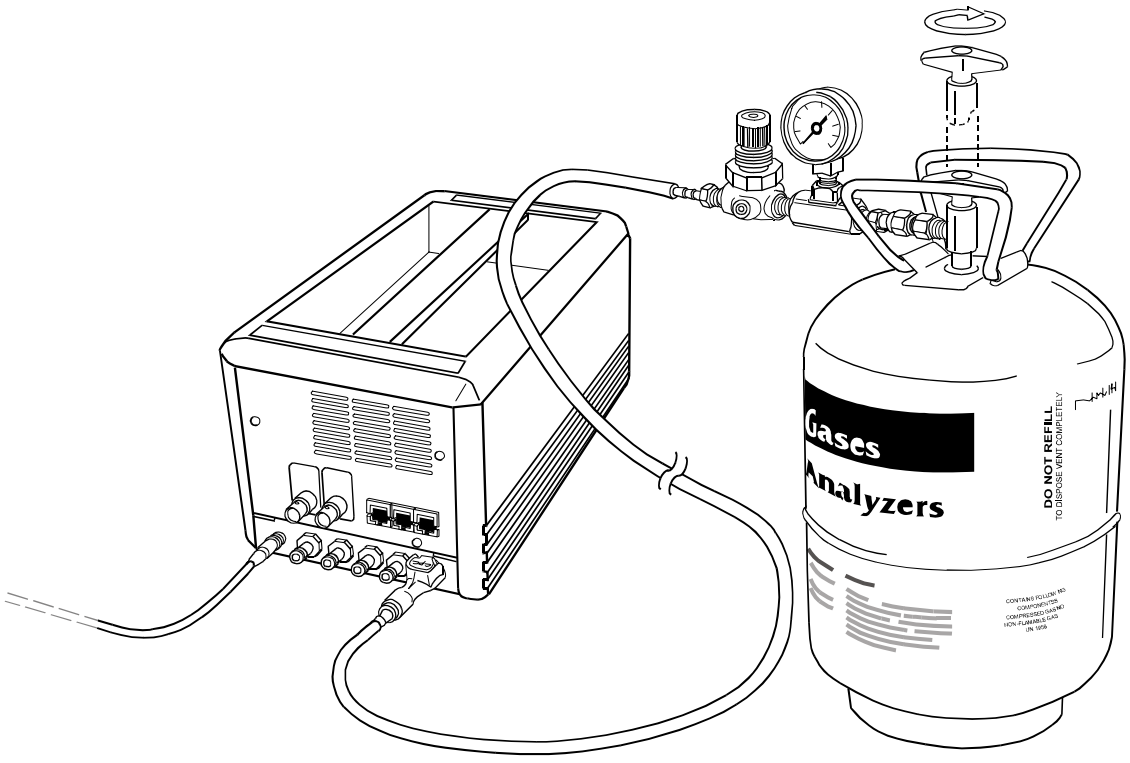


FIGURE 14. Gas Calibration Setup

Single-Point Calibration

Press (1) on the <CALIBRATION> menu shown previously.

Entering new gas values (from Cal Gas bottle)

The screen at the left is displayed if (1) is selected. Use the △ and ▽ keys to move the cursor to a new gas value. Use (0) to (9) to enter a new gas value. For example, to enter a CO2 value of 11.0%, use the △ and ▽ keys to move to CO2 and enter 110 using the number keys; 11.0% should be displayed where the cursor is.

Pressing the ▷ key erases a digit. For example, if you wanted to enter 9.00% for CO, but accidentally entered 90.00%, pressing the ▷ would remove the last digit and 9.00% would be displayed.

Pressing the ◁ key changes the value at the cursor location to a 0.

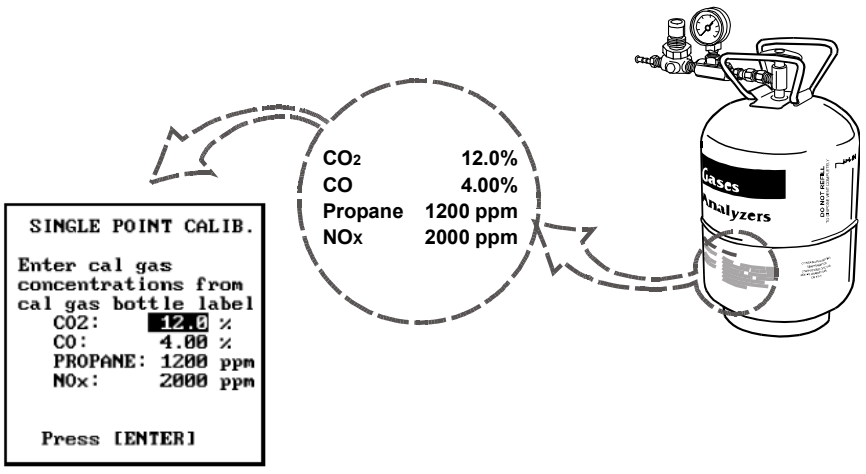


FIGURE 15. Entering New Gas Values (from Cal Gas Bottle)

IMPORTANT: If the calibration gas does not contain NOx, set the NOx gas concentration to 0 ppm. If the concentration is not set to 0 ppm, the unit calibrates the NOx sensor incorrectly. As a result, the NOx readings will be extremely erratic. This can be corrected by recalibrating the unit with NOx.

When you have entered the correct values, press (ENTER).

If the Maintenance Required status message "Single Pt Cal Warn" appears after completion of the calibration, check your gas bottle and repeat the calibration procedure. If the warning message persists, contact Vetronix at (800) 321-4889. Ask for Toyota Customer Assistance.

Calibration Verification

To verify the correct operation of the Gas Analyzer after a calibration, return to <DATA LIST> mode and press (✱)(F3) to shut off the pumps, then feed calibration gas into the calibration port of the analyzer. The display should show the gas bottle readings for CO, CO2, and NOx. To get the equivalent HC readings as shown on the screen, divide the bottle propane concentration by 2 (i.e., 1200 ppm on the bottle will read about 600 ppm on the Gas Analyzer).

GLOSSARY

Press (F0) to select the Glossary from the Gas Analyzer menu.

The Glossary contains definitions of many emissions-related terms. Pressing the ▲ and ▼ keys moves the cursor one entry at a time. Pressing (✱) and the ▲ and ▼ keys moves the cursor one page at a time. Once the glossary term in which you are interested is highlighted, press (ENTER) to display the glossary entry for that term.

ACTIVE KEYS

▲ ▼	Move the cursor (highlight) up and down.
(✱)▲	Change to next page.
(✱)▼	
(ENTER)	Display Glossary information.

CATALYST
A catalyst is typically an element that initiates and/or accelerates a chemical reaction between other elements without affecting itself.

When viewing a glossary definition with more than one screen of text, the ▲ key is used to move to the previous text screen and the ▼ key to the next text screen.

ACTIVE KEY

(EXIT)	Return to Glossary list.

7.0 DATA LIST PARAMETER DESCRIPTION

HYDROCARBONS (HC)

UNITS	RANGE
PPM	0 - 20,000

Hydrocarbons (HC) are basically particles of raw, unburned fuel or oil. The most common cause of excessive HC emissions is misfire due to ignition, fuel delivery, or air induction problems. Other causes include lean or rich air/fuel mixtures, excessive EGR dilution, clogged injectors, incorrect ignition timing, low cylinder compression, and intake valve deposits.

CARBON MONOXIDE (CO)

UNITS	RANGE
%	0 - 10

Carbon monoxide (CO) is a by-product of incomplete combustion and is essentially partially burned fuel. High CO levels are generally caused by excessively rich air/fuel mixtures. Common causes of rich mixtures include restricted air cleaner, leaky injectors, excessively high fuel pressure, and improper closed loop control operation.

WARNING!

CO is a colorless, odorless gas and is poisonous. Lethal concentrations can result in death. When indoors, always connect an exhaust ventilation hose to the vehicle tailpipe or operate in a well ventilated area.

CARBON DIOXIDE (CO2)

UNITS	RANGE
%	0 - 20

Carbon dioxide (CO2) is a by-product of efficient and complete air/fuel combustion. Generally speaking, the higher the CO2 level, the more efficient the engine is operating. Common causes of low CO2 (decreased combustion efficiency) include air/fuel mixture imbalances, misfires, and mechanical problems.

OXYGEN (O2)

UNITS	RANGE
%	0 - 25

Oxygen (O2) readings provide a good indication of a lean running engine, since O2 increases dramatically with leaner air/fuel mixtures. Excessively high O2 levels are most commonly caused by misfires or any condition that causes air/fuel mixtures to be leaner than stoichiometry (14.7 to 1).

Exhaust oxygen levels on vehicles without secondary air injection (AIR) or with the air hose pinched off should be low, approximately 1.5% or less. With the AIR on, O2 levels will be about 3% to 4%. O2 emissions should be stable until the air/fuel ratio shifts leaner than 14.7:1, then rise quickly. This makes O2 a good indicator of a lean condition.

OXIDES OF NITROGEN (NOX)

UNITS	RANGE
PPM	0 - 4,000

Oxides of Nitrogen (NOx), which include both nitrogen monoxide (NO) and nitrogen dioxide (NO2), are formed when combustion temperatures exceed approximately 2500°F. Anything that causes combustion temperatures to rise also causes NOx levels to rise. Common causes of high NOx include cooling system problems, lean air/fuel mixtures, incorrect O2S operation, improper EGR operation, and incorrect ignition timing.

AIR/FUEL RATIO (AFR)

UNITS	RANGE
numeric	0 - 150

Air/fuel ratio, or AFR, is useful to determine how close the engine is running at stoichiometric conditions. A reading of 14.7 represents the ideal balance between power and fuel economy. Less than 14.7 defines rich, greater than defines lean.

APPENDICES

A. TROUBLE SHOOTING: IF YOU'RE HAVING A PROBLEM

B. QUESTIONS MOST FREQUENTLY ASKED

C. GAS ANALYZER SPARE PARTS CHART

D. GAS ANALYZER OPTIONS CHART

E. TECHNICAL SPECIFICATIONS

A. TROUBLE SHOOTING: IF YOU'RE HAVING A PROBLEM

The Gas Analyzer is a very sophisticated piece of test equipment. Occasionally problems occur. The Gas Analyzer has extensive on-board self-diagnostics that generate warning or error messages if a problem is detected. You may find some problems first. The most common method of clearing errors are:

- Repowering the Tester
- Checking system status
- Zeroing
- Repowering the Gas Analyzer
- Calibrating

If the Gas Analyzer does not return to normal operation after trying all of the suggestions, please refer to the Introduction section on Warranty and Repair information.

PXA STATUS MESSAGES

The first place to check after receiving a warning/error message is <1: CHECK STATUS> under the <MAINTENANCE> menu. The presence of a message indicates that it is currently active. The following list of warning/error messages describes the condition and possible solutions.

1. Warmup in Progress

When the Gas Analyzer is first powered on, the gas measurement system requires 5 to 15 minutes to warm up and stabilize. When this flag is active, the Bench Warning message may also appear. If the system does not clear the Warmup in Progress flag after 20 minutes, recycle power. If, after 10 minutes more, the unit does not clear the Warmup in Progress flag, then an internal problem exists.

2. Zero Warning

The Zero Warning message indicates that at least one of the gas's zero levels changed by more than 5% of the last zero level. Performing another zeroing of the Gas Analyzer should remove this message. The unit may not be completely warmed up internally. The unit is sensitive to temperature. The longer the unit is on, the more accurate and stable the Gas Analyzer performs.

3. Zero Required

The Zero Required message indicates that the Gas Analyzer has determined a need to zero the unit. Zeroing the unit provides a reference condition to measure the vehicle exhaust against. The Gas Analyzer normally needs to be zeroed every 20 to 30 minutes.

4. O2S Zero Warning

The Oxygen Zero Warning message indicates that the sensor connector was still attached during the O2S Zero procedure, or the oxygen sensor hardware is not working properly. Re-run the O2S Zero procedure under the <MAINTENANCE> menu. If the message returns, then an internal problem exists.

5. O2S Cal Warning

The Oxygen Calibration Warning message indicates that the oxygen sensor did not measure the minimum voltage required for a fixed oxygen setting. This occurs for the following reasons: the oxygen sensor connector is not connected, not enough air flow is reaching the oxygen sensor, or the oxygen sensor has reached the end of its useful life. If the first two conditions are met, then replace the oxygen sensor.

6. NOx Zero Warning

The NOx Zero Warning message indicates that the sensor hardware is not working properly. Re-run the NOx Zero procedure under the <MAINTENANCE> menu. If the message returns, then an internal problem exists.

7. NOx Cal Warning

The NOx Calibration Warning message indicates that the NOx sensor did not measure the minimum voltage required for a minimum NOx setting. This occurs for the following reasons: the NOx sensor is connected improperly, the wrong bottle value for NOx was entered during calibration, or the NOx sensor has reached the end of its useful life. If the first two conditions are met, then replace the NOx sensor. If the bottle doesn't contain any NOx, the NOx bottle value must be set to 0. (See *Gas Analyzer Calibration on page 352*).

8. Single Pt Cal Warn

The Single-point Calibration Warning occurs under two different operations. If this message occurs during a zeroing operation, then the Oxygen Sensor is suspect. Check the oxygen sensor connector. Re-zero, pressing (5) under the <GAS ANALYZER> menu. This may need to be repeated. If the Single-point Calibration Warning occurs during a Single-point Calibration, it indicates that one or more of the following gases (HC, CO, CO2, or NOx) calibrated with more than 5% difference from the last Single-point Calibration. Check the bottle values entered and perform a Single-point Calibration again. If the bottle doesn't contain any NOx, the NOx bottle value must be set to 0. (See *Gas Analyzer Calibration on page 352*).

9. Two Pt Cal Warn

The Two-point Calibration Warning occurs when one or more of the following gases (HC, CO, or CO2) calibrated more than 5% difference from the last calibration. Recalibrate the unit, checking the bottle values for correct concentrations. If the warning continues to occur, refer to the Introduction section on Warranty and Repair information.

10. Low Flow

The Low Flow message indicates an obstruction in the sample system. Remove sample hose from the analyzer. If the Low Flow condition goes away, check the hose for kinks or obstructions. Blow air through it to remove possible obstructions. If the Low Flow condition still exists, check the filters. If the Low Flow condition exists with the filter bowl separated, then the unit has an internal problem. If the filter bowl is full of water, stop testing and remove power immediately, inspect the check valve and drain filter, and assure that the drain pump is operational.

11. Bench Warning

An internal hardware problem has been detected. This warning may occur if the Gas Analyzer is still warming up, in which case wait until the unit has finished warming prior to recycling power. Repower the unit and check to see if the messages clears.

12. Communications Failure

The Tester cannot communicate with the Gas Analyzer. Check the power connection to the Gas Analyzer. The fan should be blowing out of the front panel. Also check the instrumentation port cable at both the Tester and the Gas Analyzer. It should be plugged into the "Tester" port. Try to reestablish communication. If the unit displays Communications (1) and briefly flashes Communications (2), turn off the Tester and turn it back on.

13. Communications Error (1)

This error occurs when the Tester loses communication with the Gas Analyzer while collecting data. This happens if the battery voltage drops below 8 volts to the Gas Analyzer. This happens if power is supplied by the cigarette lighter and the engine is cranked or the key is turned off. Check the Gas Analyzer to ensure that power is applied. Try to reestablish communication first with the Tester prior to recycling power to the Gas Analyzer.

14. Communications Error (3)

This error occurs when the Tester cannot download information into the Gas Analyzer. This occurs if the Tester loses communication with the Gas Analyzer while collecting data or the Gas Analyzer power drops below 8 volts.

SYMPTOMS

1. Does not operate

The Gas Analyzer fan is not blowing. Check the fuse in the Gas Analyzer power cable or measure the source to assure that battery voltage is present. If the NOx access panel is removed, a green blinking LED shows that the gas measurement subsystem is operating properly.

2. Erratic gas readings

If the Gas Analyzer is reading erratic gas data, it may be improperly calibrated. <CHECK STATUS> for possible warnings and then recalibrate the unit. If the readings are still erratic, the unit may have an internal problem.

3. Does not read data when sampling vehicle exhaust

The ambient air solenoid may be active. If this is the case, press (✱)(F1) to start sampling vehicle exhaust. The pumps must also be running to read gas data. If the unit is in standby mode, press (✱)(F3) in the <DATA LIST> mode to turn the pumps on.

4. Does not read zero when sampling ambient air

If the hydrocarbons (HC) reading is above 20 ppm immediately following a zeroing and the probe is not measuring vehicle exhaust, this is considered a Hydrocarbon Hangup condition. This is caused by HC residues trapped somewhere in the sample system. First re-zero the Gas Analyzer. Next, run the analyzer sampling through the sample port with the hose off to determine if the residue is in the hose. If the buildup is in the hose, blow the hose out with an air source that does not contain oil. Run the analyzer with the hose attached for 10 to 30 minutes, keeping the probe free of vehicle exhaust. In addition, check the filters for buildup. Replace if dirty. Remember that the lower filter in the Filter Bowl gets dirty from the inside out.

5. NOx readings are erratic

If the NOx readings bounce around when little or no NOx is present or jump to 1000 or more for no reason, most likely the sensor needs to be zeroed and calibrated again.

6. Leak Test fails

If the Leak Test fails initially, recheck any filter that may have just been serviced. Next, remove the hose, cover the sample port and retest. If it passes, the problem is in the hose. Otherwise, separate the filter bowl, plug the inlet, and retest. If it still fails, the problem lies inside the Gas Analyzer.

7. Locks up

If the Tester locks up, turn off the Tester. Press ON and re-enter the previous test environment. If the Gas Analyzer still does not communicate, recycle power to the Gas Analyzer. Check for electrical interference sources such as spark plugs and wires, faulty regulator, and alternators.

8. One I/P port works, but the other one does not

If one I/P port works, but the other one does not work, then the hardware is malfunctioning. Both ports are identical and interchangeable.

B. QUESTIONS MOST FREQUENTLY ASKED

1. How often should the Gas Analyzer sampling and drain filters be replaced?

For the sampling filter, two to four weeks, based on usage. If, after zeroing and while sampling fresh air, the NOx value is greater than 20 ppm, check for excessive residue on the inside of the filter; it may need to be replaced. The drain filter should be replaced every two to three months, based on usage.

2. How often should the Gas Analyzer be calibrated?

Every three weeks, based on basic usage (repair grade).

3. How often should the Gas Analyzer be zeroed?

Before every run, and when prompted by an on-screen message.

4. What is the life expectancy of the O2 and NOx sensors?

One year for the O2 sensor and two years for the NOx sensor, based on usage.

5. What is the difference between the gas used to calibrate the Gas Analyzer and the state certification's inspection gas?

Some states may use a hexane blend of inspection gas for certification instead of the propane gas used for calibration. Even though the state may check your analyzer with hexane gas, this gas should not be used for calibration.

6. What gas do I use to calibrate the Gas Analyzer?

For Single-point Calibration, use Mid-Bar90 with NOx (Quad Blend).

7. What should I do when a problem occurs with the Gas Analyzer?

First, refer to the troubleshooting guide in the PXA-1000 Operator's Manual to assist you in locating and correcting the problem. If the problem cannot be corrected, refer to the Introduction section on Warranty and Repair information.

8. Can I use the PXA-1000 to read diesel exhaust emissions?

No. The analyzer was designed for spark ignition engines that use gasoline for fuel.

9. Do I need to send in my Gas Analyzer to have the O2 and NOx sensors replaced?

No. The PXA-1000 was designed to allow you to easily replace serviceable items such as filters, O2 sensors, and NOx sensors in order to eliminate having to pay shipping fees and wait for simple Gas Analyzer maintenance. Step-by-step on-screen instructions were designed to walk you through these service procedures, including O2 and NOx sensor replacement.

10. How do I know if my Gas Analyzer is reading correctly?

There are several ways to determine if your analyzer is displaying correct emissions readings. See *Calibration Verification on page 353*.

11. While checking the PXA-1000 with the propane calibration gas, the HC readings are reading half of the value listed on the bottle. Does my Gas Analyzer need to be recalibrated?

No. When reading propane calibration gas through the sample port of the analyzer, you must multiply the displayed HC reading by 2 (approximately).

12. Is the PXA-1000 a BAR90-approved analyzer, and can I use it for state emissions certification inspections?

The PXA-1000 meets all of the BAR90 requirements for the Gas Analyzer portion of BAR90, but it is not BAR90-certified. BAR90 requirements cover a complete emissions certification system, of which the Gas Analyzer is just one part.

The PXA-1000 was designed to be used as a diagnostic tool to help locate problems that cause vehicles to fail state emissions inspections. Emissions certification inspection requirements are different in each state; therefore, it is difficult to imply that the PXA-1000 could be used for certification in your area. Contact your state or local I/M program office to obtain information on emissions certification and inspection in your area.

C. GAS ANALYZER SPARE PARTS CHART

DESCRIPTION	VETRONIX PART NO.	SOLD IN UNITS
Oxygen Sensor	06002089	1 ea.
NO_x Sensor	06002100	1 ea.
Gas Regulator, Valve, and Hose	02002052	1 ea.
Filter Service Kit: Coalescing Filter Particulate Filter Filter Element Seal	01002006	Set of: 5 ea. 5 ea. 1 ea.
Drain Filter	06002102	1 ea.
Air Filter	06002090	1 ea.
Hose/Probe Assembly	02002053	1 ea.
Sample Line/Hose Assembly	03002079	1 ea.
Flex Tip Probe	03002078	1 ea.
Probe Handle	03002080	1 ea.
Probe Tip Cap	06002098	1 ea.
Drain Line Check Valve	06002103	1 ea.
Hose Securing Strap 10.5	06002105-01	1 ea.
Hose Securing Strap 21	06002105-02	1 ea.
Cable, DC Power	02002049	1 ea.
Y-Adapter Cable	02001080	1 ea.
Battery Adapter Cable	02001636	1 ea.
I/P Cable	02001720	1 ea.
Bumper Foot	06002104	1 ea.

D. GAS ANALYZER OPTIONS CHART

DESCRIPTION	VETRONIX PART NO.	SOLD IN UNITS
Soft Storage Case	02002044	1 ea.
12V Power Supply	02002048	1 ea.
Diffusion Probe Tip	TBD	1 ea.
Dual Exhaust Probe	TBD	1 ea.

E. TECHNICAL SPECIFICATIONS

Dimensions 13" x 6.5" x 7.3"
Weight 12 lbs.
Power Requirements 12VDC @ 3A
Storage Temperature -29°C to 70°C (-20°F to 158°F)
Operating Temperature 2°C to 50°C (35°F to 122°F)
Warmup Time 15 minutes maximum
Relative Humidity 0-90% non-condensing

GAS	RANGE	RESOLUTION	ACCURACY
HC	0–20,000 ppm	1 ppm	6 ppm greater than absolute or 5% of reading
CO	0–10%	0.01%	0.06% greater than absolute or 5% of reading
CO2	0–20%	0.1%	0.5% greater than absolute or 5% of reading
O2	0–25%	0.01%	0.01% greater than absolute or 5% of reading
NOx	0–4000 ppm	1 ppm	32 ppm at 0-1000 ppm 60 ppm at 1001-2000 ppm 120 ppm at 2001-4000 ppm

NOTE Accuracy specifications are based on bottled, dry calibration gas.